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University Research Program

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James Freeman and Richard Beilock

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16. Abstract

In Arizona and Florida, intrastate deregulation has resulted in surprisingly moderate changes in motor carrier freight rates. In both states, rates have not become unstable and, therefore, are not difficult for users to determine. Moreover, the system of commodity classification previously used in ratemaking has been maintained.

This study examined pre- and post-deregulation interstate and intrastate motor carrier rates for 12 routes in Arizona and 20 routes in Florida. Comparisons of corresponding interstate and intrastate rates reveals that over all routes studied, interstate rates rose at a faster pace than did intrastate rates. Furthermore, the results in both Arizona and Florida indicate that the premium paid per unit weight for small shipments has declined since deregulation. In Arizona, the penalty levied prior to deregulation for service to remote areas has largely disappeared. The study's findings, coupled with the results of earlier studies which indicate that service levels have been maintained or improved, lead to the conclusion that from the point of view of the shipper/receiver deregulation has been a success.

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Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
	AREA			
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
	MASS (weight)			
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
	VOLUME			
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
	TEMPERATURE (exact)			
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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*1 in = 2.54 (exactly). For other exact conversions and more detailed tables, see NBS Misc. Publ. 286, Units of Weights and Measures, Price $2.25, SD Catalog No. C13.10:286.

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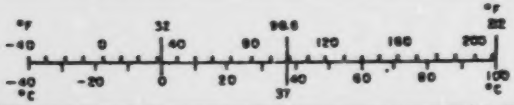
Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
	LENGTH			
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
	AREA			
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
	MASS (weight)			
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
	VOLUME			
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
	TEMPERATURE (exact)			
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



THE IMPACT OF MOTOR CARRIER DEREGULATION ON FREIGHT RATES IN ARIZONA AND FLORIDA

FINAL REPORT

APRIL 30, 1985

Principal Investigators

Richard Beilock
Assistant Professor
Food and Resource Economics Department
University of Florida
Gainesville, Florida
32611

James Freeman
Associate Professor
College of Business and Economics
University of Kentucky
Lexington, Kentucky
40506-0034

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INTRODUCTION

Since at least the Kennedy administration, the efficacy of economic regulation of motor carriers has been open to serious question. In the 1970's this issue was brought into sharper focus by efficiency concerns related to energy use, due to the 1973 oil embargo, and by a growing sentiment in the country against government intervention in business. In response to these pressures, during the last third of the 1970's, the Interstate Commerce Commission (ICC) began loosening motor carrier regulation in many areas, primarily by making more liberal interpretations of existing statutes.

In 1980 Congress passed the Motor Carrier Act of 1980 (MCA 1980) which codified and extended the reforms begun by the ICC. In general MCA 1980 loosened but did not remove the regulatory apparatus. Operating rights still must be obtained, though the application process has been greatly streamlined; rates still are regulated, though with a hand softened by a "zone of rate reasonableness." The halfway nature of these reforms and the history of their implementation make difficult the use of the experiences of the interstate motor carrier industry to provide empirical answers to questions surrounding the usefulness of motor carrier regulation. These difficulties are due to two major factors:

1. As the ICC progressively was reinterpreting statutes throughout the last half of the 1970's, it is impossible to establish clear before and after reform periods, and

2. MCA 1980 altered, but did not remove regulations in most areas. It is difficult if not impossible, in many instances, to quantify or otherwise adequately describe the nature of these changes. For example, if rate regulation a'la the Motor Carrier Act of 1935 is a 10 and no regulation is a 0, what number represents the rate regulation provisions of MCA 1980? The result of this difficulty is that studies of experiences in the interstate motor carrier industry tend to be MCA 1980-specific, rather than being generalizable to overall questions regarding motor carrier regulation.

The intrastate motor carrier industries in Arizona and Florida, on the other hand, provide the opportunity to study markets which have clear before and after reform periods and easily defined changes in regulations. Overnight both states went from traditional, Motor Carrier Act of 1935-style economic regulation to no regulation at all. In the case of Arizona, there was almost two years advance notice before deregulation occurred. In Florida, however, deregulation came as a surprise, due to the last minute failure of the Florida Legislature to avoid the lapsing of regulation under Florida Sunset legislation. A more detailed review of the events leading up to deregulation in these states is presented in Appendix 1.

Arizona and Florida are also of interest because they offer two distinct settings which are typical of many areas of the U.S. Arizona is similar to a large number of Midwest, Western, and some Southern states, with one or two major hubs (Phoenix-Tucson) surrounded by extensive areas which are sparsely populated. Florida, on the other hand, is more typical of eastern Texas, California, and the Northeast, with several large metropolitan areas (e.g. Miami, Jacksonville, and Tampa) and strip urbanization areas (e.g. Florida's southeast coast) interspersed across a region which includes considerable expanses of rural areas. Finally, both states are large in terms of land area. This allows for the study of both short and long haul operations within each state's boundaries.

Considering the importance of motor carriage in the U.S. and the aforementioned advantages of using Arizona and Florida to examine the impacts of regulatory reforms, it is not surprising that a number of studies on the topic focus on Arizona and/or Florida. Several of these are briefly reviewed in the next section. Virtually all of these studies have resorted to carrier or shipper/receiver perceptions of rates and service levels before and after reform. While such studies have considerable value, the addition of studies employing actual rate/service data would be desirable. The principal reason for the dearth of such studies is the difficulty involved in obtaining rate and service data, particularly after the industry is deregulated.

In this study rate data have been collected for various intrastate routes in Arizona and Florida. These data are employed to address several issues regarding the impacts of deregulation of motor carriers. These include the impacts of deregulation on:

1. average rates,
2. rates per mile,
3. differences between rates based on cargo types,
4. differences between rates per unit weight for large and small shipments,
5. differences between rates to urban and rural areas,
6. rate variability, and
7. carrier entry and exit.

To the greatest extent possible, the analyses for Arizona and Florida paralleled one another to facilitate comparisons.

In the next section the issues addressed in the study will be further discussed.

ISSUES AND PREVIOUS STUDIES REGARDING MOTOR CARRIER REGULATORY REFORM

The Rationale of Traditional Regulation

Traditional motor carrier regulations (e.g. the Motor Carrier Act of 1935) are designed to promote stability and equity for users and suppliers. Stability with regard to suppliers is provided for by entry and exit restrictions. Entry restrictions are meant to ensure that only qualified, financially sound carriers may serve and that they are sheltered from the ravages of unbridled competition. As with 'stationary' utilities (such as water and electricity), rates are regulated to provide for the continuing financial security of carriers without excess profits. Stability for users is provided for by the controls on carrier numbers and by rate regulations which prevent frequent movements in rates or movements not justified by underlying costs.

Equity in service is provided for by a combination of the common carrier obligation (which requires that carriers serve all shipper/receivers in a nondiscriminatory manner) and rate regulations. Rate regulations are employed to reduce rate differentials between groups of shipper/receivers which would likely receive favorable terms in an unregulated market and those which would be charged relatively higher rates. Three prominent groupings of shipper/receivers in this regard are urban and rural shipper/receivers, large and small shipper/receivers, and shipper/receivers with large and small shipment sizes. In each case, the latter type of shipper/receiver is assumed to be in a weak bargaining position with carriers or to have less desirable freight than is true of the former shipper/receiver type. By regulating rates to reduce differentials between the types of shipper/receivers in each group a cross-subsidy is created. In theory, the more favorably situated shipper/receiver types are obliged to pay somewhat higher rates so that carriers can afford to serve the less favorably situated shipper/receivers at less-than-free-market rates.

Rate regulations may be similarly employed to increase rate disparities. The most common example of this is value-of-service pricing in which higher rates are levied against cargoes with higher value, ceteris paribus. The social rationale behind such a system is to cross-subsidize basic and 'deserving' industries such as agriculture and mining with the higher rates levied on producers of highly valued, manufactured goods.

Consequences of Regulatory Reform

Service Quality

Stripped of the ability to compete with respect to rates, regulated carriers may be expected to compete by offering superior service. White (1972) developed a model which suggested that carriers offer additional services up to the point where marginal costs equal marginal returns. In an unregulated market lower priced/lower quality services can be provided. With rate regulation, however, bargain basement rate/service options are precluded. Therefore ceteris paribus, one would expect to find higher average service levels in regulated motor carrier industries than in those with no regulation. However, in addition to regulated rates, regulated markets typically have restricted entry. Along routes in which only one or a few carriers have authority to operate, carriers face downward sloping demand curves with marginal revenues below average revenues. Providing service up to the point where marginal cost equals marginal revenue may result in lower average service levels than in competitive situations even if the regulated rates are higher.

The direction of change in service levels with deregulation is therefore an open question. On one hand, rate regulation forces competition entirely into the arena of service levels. On the other hand, entry restrictions limit competition. Empirical work on the subject has tended to show modest improvements or no changes in various measures of service quality and frequency with deregulation or reform.

The current study does not add directly to evidence regarding service levels. Rather, it focuses on what has happened to rates in the pre- and post-deregulation eras. These results, coupled with the existing evidence that service levels have been consistent, will help to complete the picture of what happens to motor carriage when regulations are removed.

Average Rate Levels

With deregulation, entry restrictions are removed, thereby eliminating or at least weakening any monopoly power held by carriers. This would normally be expected to put downward pressure on rate levels. This, however, depends upon the levels at which rates were regulated. Proponents of the capture theory of regulation[2] would assert that rates are normally regulated at or near the carrier's profit maximization point (P_m in Figure 1). If, however, the regulators take a more public interest stance, rates would be restricted to lower levels which are consistent with competitive

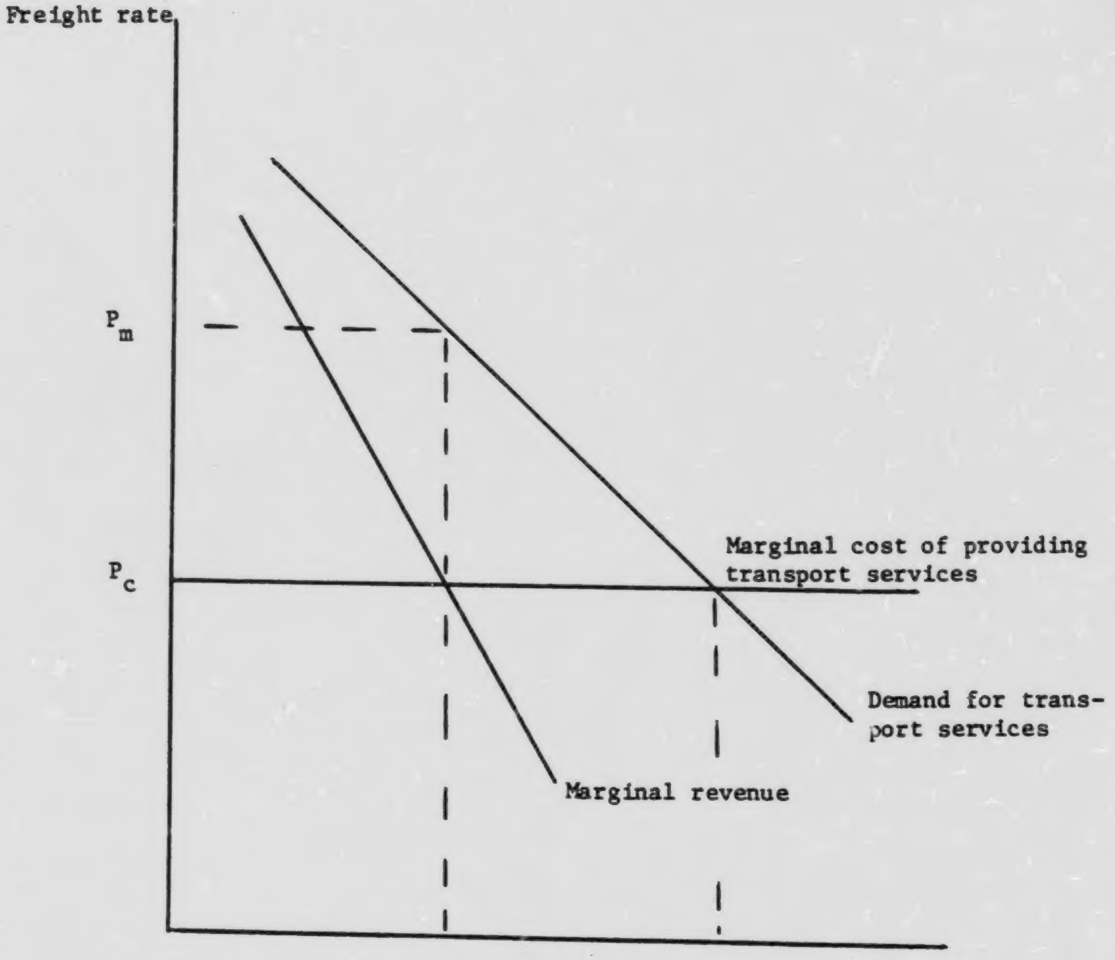

Figure 1. Profit maximization and competitive rate levels

rates (P_c in Figure 1). If rates are held to these lower levels, deregulation would not be expected to markedly alter rate levels. Some changes may result if average volumes carried by carriers are altered and if these changes are associated with large economies or diseconomies of size. Most studies, however, suggest constant or near constant economies over a wide range (see, for example, Sugrue et al. (1982) and Spady and Friedlaender (1979)). Therefore unless the underlying costs of service change with regulation, rates would only be expected to be reduced with degregulation if they had been held at artifically high levels by regulators.

There are, however, reasons to expect that the costs of service would change with deregulation. Commodity, route, and service area restrictions written into most operating authorities limit the range of loads carriers may acquire. Problems in this regard in obtaining backhauls or balanced loadings are frequently cited.[3] In the absence of operating restrictions, the ratio of full to total mileage would likely increase, with a resulting reduction in costs per unit of service.

Rates Per Mile

Rates per mile generally tend to decline as the distance travelled increases. The primary reason for this decline is that there exist costs which are largely unrelated to distance, such as those associated with pickups and drops and processing paperwork. Per mile costs (primarily fuel, driver's time, and wear and tear) would be approximately constant across distance. The spreading of the distance-unrelated costs over long distances lowers the average costs per mile. This is represented in Figure 2 by the reduction in the slopes of the dashed rays from the origin to the total cost line as one moves from lower to higher distances.

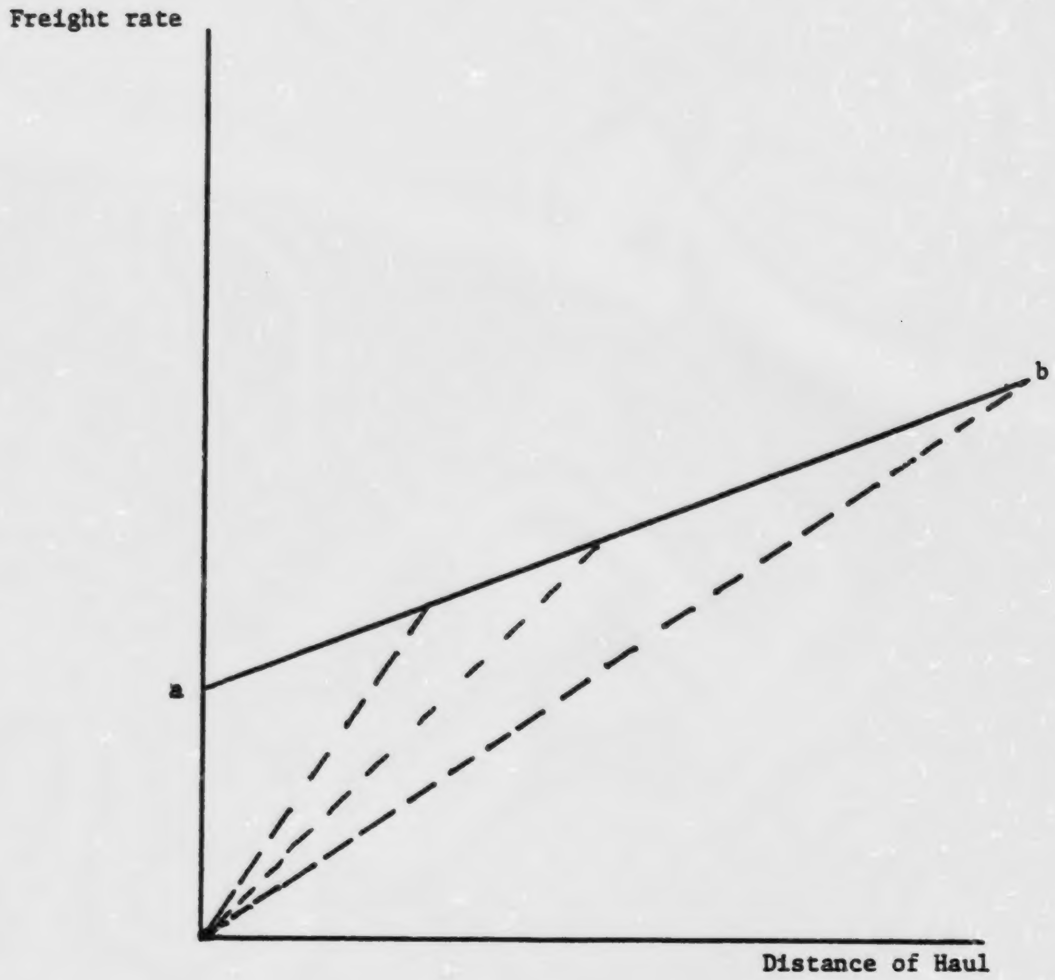
Freight rate
a
b
Distance of Haul

Figure 2. Spreading of Fixed Cost Across Distance

Of interest with regard to regulatory reform is what happens to the rate/distance gradient (i.e., the slope of ab in Figure 2). If the removal of operating restrictions allows carriers to improve efficiency, then the cost per unit distance would be expected to fall. For example, with deregulation, carriers are freed from route restrictions, and, as already discussed, may be able to improve their ratio of revenue generating-to-total mileage.

Differences Between Rates Based on Cargo Type

Depending upon physical characteristics (such as shape, density, fragility, and temperature tolerance) cargos may be easier or harder to transport. Not unexpectedly, more difficult cargos generally command higher rates. There is little reason to expect this to change when regulations are altered.

Value is another criterion used in regulated settings to determine which cargos will have higher and lower rates. Typically higher rates are charged to cargos of higher value, *ceteris paribus*. This is known as a value-of-service rate structure. Economists have traditionally explained value-of-service pricing in terms of price discrimination:

> To the economist, value-of-service pricing means price discrimination. A firm with monopoly power and the ability to separate demand for its product into seperate markets can increase its profit by charging higher rates to its customers with less elastic demands (Olsen, p. 395).

To understand how value-of-service pricing can be consistent with price discrimination, begin with the following assumptions:

1. The quantity demanded of a good (Q_D) equals the quantity transported (Q_T).
2. The selling price (P_Q) equals the sum of the F.O.B. plant price (P_{FOB}) plus the transportation rate (P_T) (i.e., there is no freight absorbtion, positive or negative), and
3. A perfectly elastic supply for the commodity (E_s).

Under these conditions:

$$(1) \qquad E_D = \frac{\%\Delta Q_D}{\%\Delta P_Q} = \frac{\%Q_T}{\%(P_{FOB} + P_T)}$$

Where: E_D = own price elasticity of demand for Q

$\%\Delta$ = percentage change

Focusing on fluctuations in transportation rates, E_D may be rewritten as:

$$(2) \qquad E_D = \frac{\%\Delta Q_T}{\frac{P_T}{P_Q} \% \Delta P_T}$$

Rearranging the terms in (2) yields

$$(3) \qquad \frac{P_T}{P_Q} E_D = \frac{\%\Delta Q_T}{\%\delta P_T} = E_T$$

where E_T = elasticity of demand for transportation.

Relaxing the assumption that $E_S = \infty$, it can be shown that:

$$(4) \qquad E_T = R \frac{P_T}{P_Q} E_D$$

where: $R = 1$ if $E_S = \infty$, and

$0 < R < 1$ if $E_S < \infty$.[4]

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The important point regarding the above is that E_T is absolutely smaller, the smaller is P_T/P_Q, ceteris paribus. Given P_T and reasonably small variations in E_D's across commodities or the absence of a strong negative relationship between P_Q and E_D across commodities, shipper/receivers of higher valued commodities would have less elastic demands for transport than those with lower valued commodities. It follows, then, that charging higher rates to shipper/receivers of higher valued cargos is consistent with charging higher rates to those with less elastic demands. In other words, value-of-service pricing may be employed as a crude form of price discrimination.

The rate discipline provided by regulation has been almost universally identified as the reason for value-of-service pricing in as inherently atomistic an industry as motor carriage. Many state regulatory agencies and the ICC have allowed cargo value as a criterion for ratemaking. Typically regulators have defended this practice on the grounds that it is necessary to ensure carrier viability or to further social goals such as subsidizing raw materials freight.

If value-of-service pricing does result from price discrimination facilitated by the power and policies of the regulators, then deregulation should result in the narrowing or elimination of rate differentials between higher and lower valued goods. If, on the other hand, value-of-service rate structures reflect differences in transport services supplied for higher and lower valued cargos, then these structures would be expected to persist in a deregulated environment.

There are two major non-discriminatory explanations of value-of-service pricing. The first is that carrier's liability and therefore insurance costs vary directly with cargo value. In a recent study Fauth (1983) developed measures of insurance and damage costs for general freight for-hire motor carriage. Fauth found that both gross claims paid (Table 1) and net claims and insurance costs (Table 2) are consistently under two percent of operating revenue. Fauth concludes:

> Statistics on loss and damage claims paid by carriers indicate that such costs represent a very small part of total freight charges and do not justify commodity value as a major dimension of the rate structure (p. 69).

In 1977 DeVany and Saving offered an alternative explanation of value-of-service pricing. They argued that shipper/receivers of urgently needed cargos are more willing to pay for prompt, readily available service than are those shipping less urgent cargoes. For nonperishable goods, the value of the cargo is a reasonable indicator of urgency as the interest costs associated with shipping delays vary directly with value. Supplying prompt, readily available service necessitates the existence of excess capacity waiting to load on demand. Relative queue lengths are regulated because carriers will join longer queues only if the costs associated with the additional expected wait are less than or equal to the premium over the rates being offered at shorter queues. Therefore, shipper/receivers requiring prompt service must pay more to compensate carriers for the additional costs associated with longer waits. As there is nothing in this explanation which is at variance with the operation of competitive markets, value-of-service pricing should be found in unregulated, as well as regulated markets.

Search costs may also account for cargo value-related rate differentials. Following a model proposed by Salop and Stiglitz and extended by Wilde and Schwartz and Sadanand and Wilde, price dispersion may exist in a

Table 1. Total Claims Paid by Motor Common Carriers of General Freight

Year	Operating revenues ($000's)	Claims paid ($000's)	Claims as a percentage of revenue
1974	12,170,387	173,904	1.43
1975	11,481,875	164,130	1.43
1976	13,299,567	172,927	1.30
1977	14,989,850	195,327	1.30

Source: Fauth

Table 2. Net Loss and Damage Costs of Motor Common Carriers of General Freight

Quarter ended	Net claims paid and insurance costs as percentage of operating revenue
March 31, 1975	1.55
December 31, 1975	1.30
June 30, 1976	1.31
September 30, 1976	1.17
December 31, 1976	1.24
June 30, 1977	1.19
September 30, 1977	1.33

Source: Fauth

competitive setting if buyers engage in differing intensities of search. Those restricting their search will pay higher prices, on average, than those searching more thoroughly. As search involves time, it stands to reason that shipper/receivers of urgently needed cargos (i.e., higher value and/or more perishable) would be more likely to engage in abbreviated searches. Moreover, if the expected result of a search is a lower rate with lower or unknown service reliability, shipper/receivers of more urgently needed cargos would find this trade-off less attractive.

In a recent study of a never-regulated, competitively structured transportation market, that for Florida produce and ornamentals, Beilock (1984) found evidence of a value-of-service price structure. Shipper urgency, as measured by the average daily loss in the cargo, was found to be a major determinant of rate levels. Given the atomistic nature of this market, price discrimination may not be possible. Moreover, the results clearly demonstrate that value-of-service pricing need not be an artifact of regulation.

Similar results were found in a study of pre- and post-deregulation Florida rates (Blair, Kasserman, and McClave (1983)). They discovered that rate differentials based upon the cargo's commodity classification[5] persisted after deregulation. While their results are consistent with a nonregulatory explanation of value-of-service rate structures, it falls short of a proof for two principal reasons. First, there may be considerable lags in adjustment after a sudden, unexpected deregulation as occurred in Florida. This would be particularly likely during the several months immediately following deregulation when it appeared likely that a court challenge would be mounted to reinstate regulation. Second, there may be advantages in preserving the commodity class structure for cargos which may be shipped both within Florida and across state lines.

Regardless of the cause, however, there is reason to question if value-of-service rate structures will be eliminated under deregulation.

Differences Between Rates per Unit Weight for Large and Small Shipments

Because of the greater difficulties involved in handling a larger number of small shipments per vehicle, than one or a few shipments, rates per unit weight are normally higher the smaller the shipment size. There are two principal reasons for anticipating increased disparity between these rates after deregulation. First, in an effort to promote equity, regulatory agencies sometimes seek to lessen small/large shipment rate differences. Second, instances in which carriers have some degree of monopoly power are more likely to occur with respect to small shipment (LTL) operations than in truckload (TL) operations. This follows because of the higher entry barriers and greater economies of size associated with LTL than TL operations.

It is still open to debate, however, if economies of size in LTL operations are absolutely large or particularly strong. Much of the more recent work on the subject suggests that large economies do not exist (e.g. Friedlaender (1978), and Sugrue, Leford, and Glaskowsky (1982)). Moreover, any monopoly effects resulting from economies of size may have already been embodied in the market in the form of higher than marginal cost rate restrictions. Finally, operating efficiencies resulting from deregulation may lower costs of handling small shipments. Unfortunately, there has been virtually no empirical work examining small/large shipment rate differentials before and after deregulation. Therefore, the direction of change of such differentials remains open to question.

Differences Between Rates to Urban and Rural Areas

The rural or small community shipper/receiver is undoubtedly the most politically visible group said to be in need of regulation to prevent exorbitant rates. An excellent indicator of the level of concern for this group is Section 28(a) of the Motor Carrier Act of 1980, which directs the Interstate Commerce Commission to "make a full investigation and study of motor carrier service to small communities." In the several states in which motor carrier regulatory reform is being considered, the effect on rural/small community shipper/receivers is typically the central issue.

There are two principal reasons given for higher rural than urban rates. First, it is asserted that competition is less intense in rural areas, allowing for monopoly abuses. Indeed, it is often contended that many areas would not have service at all if carriers were not obliged under the common carrier obligation to serve all customers in their area of operation. The second reason for higher rates is that it is more difficult and costly to serve out-of-the-way locales. Roadways are often not well maintained or designed for rapid movement, and vehicles usually must operate empty or partially empty due to the lack of sufficient freight.

The effectiveness of the regulatory system in dealing with the 'rural problem' is in doubt. Considerable evidence exists to suggest that common carrier obligations have rarely if ever been enforced in most jurisdictions and that urban/rural rate differentials have not been lessened by rate regulation. Allen (1981) summarizes his findings as follows:

> Common carrier behavior implied by the service (quality) obligation is indistinquishable from unregulated profit maximizing behavior with respect to...service. Overall, then, it appears that less is required of motor carriers than conventional wisdom...would indicate (p. 111)

The results of several studies directly or indirectly examining impacts on rural and urban shipper/receivers after the Motor Carrier Act of 1980 and deregulation in Arizona and Florida are presented in Tables 3 and 4. Overall these studies indicate the following:

1. Overall service levels in rural areas in regulated jurisdictions are generally perceived as adequate. However, this adequacy is in large part due to reliance on UPS and private carriage.
2. Common carrier services are often perceived to be of low quality accompanied, sometimes, by high rates. Complaints regarding common carrier services most frequently are in regard to service quality rather than rates.
3. Rural and sparsely traveled routes maintain a positive economic value, as evidenced by their impact on the going concern value of motor carriers serving such routes.

Virtually all of the work regarding this issue has been perceptual or at best has employed highly limited samplings of rate data. Therefore, the impact of deregulation on relative rate levels remains in doubt. The work to date, however, does confirm that service quality levels are consistent or somewhat improved for both urban and rural shipper/receivers when motor carrier regulations are relaxed or removed.

Rate Variability

One of the more important rationales for imposing motor carrier regulations is the contention that the industry is inherently unstable. One aspect or expression of this instability was frequent changes in rate levels. Few appear concerned with fluctuating prices in industries such as retail groceries or gasoline. But changes in transportation rates are said to result in high transactions costs as users invest inordinant amounts of resources for price discovery and suffer from being forced to plan in a

Table 3. Studies Examining the Effects of the Motor Carrier Act of 1980

Author	Publication	Sample Characteristics and Methodology	Conclusions
Donald Harper	"Consequences of Reform of Federal Economic Regulation of the Motor Trucking Industry," Transportation Journal. Vol. 24:4, 1982, pp. 35-58.	Primary data source: personal interviews and mail questionnaires to 40 carriers and 49 shipper/receivers located throughout Minnesota. Methodology: contingency analysis.	1. Increased number of service options. 2. Few 'remote point' service quality complaints. 3. Some indications that rate discounting was more common for urban than for nonurban shipper/receivers.
ICC, Office of Policy and Analysis	Interim Report: Small Community Service Study, June 1981.	Primary data source: 374 questionnaries returned (out of 514 mailed) in January 1981 by shipper/receivers in communities under 15,000 population in 10 states.	1. Most report no change in the following, but those reporting improvements greatly outnumber those seeing worsened conditions: a. service availability b. service quality. 2. Little change in advance knowledge about freight rates
Alice Kidder	"Economic Consequences of the 1980 Motor Carrier Act on Service to Rural Areas," Invited Paper U.S. DOT conference on Regulatory Reform in Surface Transportation, 1983, pp. 251-273.	Primary data source: two interviews (in 1979 and 1981) with 290 firms located in rural areas of South Carolina, Georgia, and North Carolina. Methodologies: contingency analysis, logit analysis.	1. Overall improvements in service quality. 2. Somewhat greater tendency for those located in very remote areas (i.e., far from interstates) to note service deteriorations. 3. Number of carriers and capacity has increased. 4. General pattern of rate increases.
Walter Miklius	"Effect of Regulatory Reform on Motor Carrier Quality of Service," Invited Paper U.S. DOT Conference on Regulatory Reform in Surface Transportation, 1983, pp. 299-324.	Primary data source: 189 (out of 200) mail-phone surveys of shipper/receivers 1973-74, and 237 (out of 400) mail surveys in 1982. Note: the sample surveys were drawn from firms in various SMSA/s.	1. Few changes in rates or service quality. 2. Some increase in number of carriers offering service. 3. Some initial confusion

Table 4. Studies Examining the Effects of Motor Carrier Deregulation in Florida and Arizona

Author	Publication	Sample chatacteristics and Methodology	Conclusions
		Florida	
Richard Beilock and James Freeman	"Motor Carrier Deregulation in Florida," Growth and Change, Vol. 14:2, 1983, pp. 30-41, and The Effect of Transportation Deregulation on Motor carrier Service in Florida and Arizona, prepared for U.S. DOT, 1983.	Data sources: Mail surveys of shipper/receivers and carrier located throughout the state, June 1981 and June 1982. In 1982, shipper/receivers were divided into urban and rural based on community size (over or under 10,000) and proximity to SMSA. Shipper/receiver sample size was 144 in each year, by coincidence. Methodology: contingency analysis.	1. Overwhelming support among shipper/receivers for continued deregulation, regardless of urban or rural. 2. General consensus among urban and nonurban shipper/receivers that deregulation has improved or not harmed the quality and quantity of service-rate options. 3. Service to urban shipper/receivers seems to have improved more than for nonurban shipper/receivers. 4. Split among carriers regarding deregulation.
Roger Blair, David Kaserman, and James McClave	The Economic Effects of Intrastate Trucking in Florida, prepared for Florida State Attorney General's Office, 1983.	Data sources: collected rate data of 10 major carriers from three origins to seven destinations (three of which are small communities) at three post-deregulation time periods. Methodology: regression.	1. Deregulation has resulted in (or been coincident with) a 14 to 16 percent drop in rates-including rates to outlying areas. 2. There is no evidence of collusion among carriers.
Steven Bolton, Robert Conn, and Jay Smith	"Florida Motor Carrier Deregulation: The Immediate Effect of Sudden Deregulation from the Perspective of Shipper/Receivers in Small Communities," Invited Paper, U.S. DOT Conference on Regulatory Reform in Surface	Data sources: intensive surveys of 20 shipper/receivers in three small, isolated communities in Florida. Methodology: results tabulated and discussed (too few observations for contingency analysis).	1. Few changes in rates or service quality. 2. Some increase in number of carriers serving shipper/receivers 3. Some initial confusion.

Table 4. Studies Examining the Effects of Motor Carrier Deregulation in Florida and Arizona

Author	Publication	Sample characteristics and Methodology	Conclusions
		Florida	
ICC, Office of Policy and Analysis	Initial Carrier and Shipper Responses to Interstate Trucking Deregulation in Florida, June 1981.	Data sources: conversation with carriers, examination of published tariffs, and statewide survey of shipper/receivers Methodology: contingency analysis.	1. Reduced rates and increased competition to most points including rural areas. 2. Carriers continuing to serve nonurban routes. 3. Reduction in empty mileage. 4. Few changes in service noted by shipper/receivers. Those seeing improvements outnumber those seeing declines.
Michael Putsay	"State Regulation and Motor Carrier Service to Small Communities," Invited Paper U.S. DOT Conference on Regulatory Reform in Surface Transportation 1983, pp. 414-429.	Data sources: examined the National Highway and Airway Carriers and Routes Guide to determine levels of motor carrier service in 50 small commu- in each of four states (Florida Texas, Ohio, and South Dakota. Methodology: results tabulated.	Florida has the second highest average number of intrastate carriers serving each small community, suggesting that regulations are not required to ensure service to these areas.
		Arizona	
Richard Beilock and James Freeman	Attitudes of Arizona Shippers and Motor Carriers Regarding Deregulation and the Motor Carrier Tax: One Year Later, prepared for Arizona Dept. of Transportation, October 1983.	Data source: Pre- and post-deregulation statewide survey (June 1982, November 1982, and July 1983) of shipper/receivers and carriers. Nonurban shipper/receivers defined as those not located in the Phoenix and Tucson metropolitan areas. Shipper/receiver sample sizes were 90, 231, and 127 in June, November, and July, respectively. Methodology: contingency analysis.	1. Carriers split regarding deregulation. 2. Rural and urban shipper/receivers appear to have experienced some rate relief and improvements in the quality/quantity of service. 3. As with Florida, urban shipper/receivers have benefitted more than those in outlying areas.

highly uncertain environment. Due to the time required to carry out the procedures required in a regulated setting to effect rate changes, a degree of rate stability is ensured, even if the regulatory agency is liberal in granting changes. The more the agency is reticent in allowing changes or requires extensive justifications for changes, the more stable are rates. Moreover, as rates must be published under regulation, price discovery problems are lessened.

Proponents of deregulation assert that, as in other industries, motor carriers' rate information would be available. Certainly, in a deregulated environment special deals will be made every day or hour. However as a practical matter, shipper/receivers infrequently using a given transport service will be as well off as they were under regulation if reasonable 'off the shelf' rates are readily discoverable. Larger investments into rate discovery and rate negotiations are justified for frequent users. Few would contest that under regulation special tariffs are sometimes written so that only a limited number of shipper/receivers may participate or special services are offered under a contract carriage framework. Deregulation simply allows these negotiations to be carried out in the open. The relevant questions, then, are with regard to the ease of access and stability of casual users (and users not choosing to negotiate due to slack managements) to rate information and to the stability of those rates (both with regard to the frequency of changes and the size of changes).

Carrier Entry and Exit Frequency

A related issue regarding motor carrier industry stability is entry and exit by carriers. This, in turn, may be broken down into two categories: entry and exit from the industry, and entry and exit from specific traffic lanes. With regard to the former, low start-up costs and the tendency to ignore capital replacement costs are pointed to as reasons for frequent entry and exit (failure). While no firm data exist, it is often alleged that entry and exit of carriers of exempt goods is excessive. The sharp rise in entry at the interstate level as ICC policies eased entry restrictions at the end of the 1970's is also pointed to as proof of instability. Likewise it has been alleged that failure rates since the late 1970's among motor carriers have been alarming. In a recent study, however, Miklius (1983) found that motor carrier failures do not appear to be out of line with those in other industries and that there are not significant differences in these numbers between regulated and unregulated sectors of the industry.

The latter issue - carrier entry and exit from specific traffic lanes - is of more concern in the current study. In a regulated environment the number of carriers (legally) serving a traffic lane is set and, in general, fairly stable. It should be noted, however, that having the authority (and, hence, the obligation) to serve a traffic lane and actually providing such service are two different things. Studies such as Allen (1980) indicate little, if any, effort on the part of regulatory agencies to enforce the common carrier obligation. In Arizona and Florida, the foci of the current study, these researchers could find not evidence that a carrier had ever had an opertaing certificate revoked or suspended for failure to serve an area. Nevertheless, it must be granted that under regulation shipper/receivers have available (at least nominally) a set number of known carriers.

In a deregulated setting carriers may serve or not serve traffic lanes as they please. Clearly, then, it would not be fessible to identify all the carriers which are actually serving (or are willing to serve) a given traffic lane at all times. Indeed, with all carriers having the right to serve all lanes, the number of carriers willing to serve is a function of the rate level. The germane question, however, is if there is a fairly stable number of known carriers which continue to serve these lanes in a deregulated environment. If not, then the casual user may experience problems locating suppliers.

Summary of Issues

Before proceeding to a description of the data employed in the current study, the issues raised are summarized by stating them as hypotheses:

Hypothesis 1: Deregulation results in reduced overall rate levels.
Hypothesis 2: With deregulation, costs per mile are reduced.
Hypothesis 3: Deregulation reduces or eliminates value-of-service pricing.
Hypothesis 4: With deregulation, rates for small shipments rise relative to those for larger shipments.
Hypothesis 5: With deregulation, rate differentials between rural and urban shipper/receivers grow.
Hypothesis 6: Under deregulation, rates exhibit greater variability than under regulation.
Hypothesis 7: Frequent entry and exit of carriers along given traffic lanes occurs under deregulation.

METHODOLOGY

Given the range of hypotheses to be tested, it was necessary to develop several models and statistics from the data. Whenever possible, three levels of analysis were developed to impart as complete a description as possible of the information embodied in the data: graphical, statistics developed via univariate analysis, and multivariate analysis. The first two analytical techniques have the advantages of being relatively simple and easily interpretable. However, they do not hold other conditions constant, with the resulting potential for drawing inaccurate conclusions regarding the underlying relationships. Multivariate analysis, on the other hand, does allow for holding other conditions constant, but can be expensive to generate and more difficult to interpret. In the following subsections the graphs, statistics, and models generated are described as well as the rationales for creating them.

Graphical Representation

Three types of graphs are generated: they are summarized in Table 5. In addition to depicting overall rate levels, graphics are employed to gain insight into rate differentials between high and low weight and commodity classes. In order to keep the graphs to a managable number, graphs are generated only for certain weight and commodity classifications. Selection is based on which categories are thought to be most sensitive to the effects being varied. Inclusion of interstate rates in the graphs showing rate levels is for purposes of comparison.[6] Corresponding interstate rates are subject to much of the same economic influences as intrastate rates (interest rates, general economic conditions, etc.), but would be subject to a different regulatory environment. Therefore they provide a barometer of sorts of the directions intrastate rates might have taken if ICC-like regulations had remained in force.

Table 5. Summary of Graphical Analysis

Vertical Axis	Horizontal Axis	Purpose
Minimum and maximum[1] intrastate rate and corresponding interstate rate.	Month	Provide an overview of rate levels before and after deregulation
Ratio of the per cwt.[2] rate of the lowest to the highest weight class.	Month	Indicate differences between the pre- and post-deregulation periods regarding rates by shipment size
Ratio of the rates per cwt.[3] for the lowest commodity class to the highest commodity class	Month	Indicate differences between the pre- and post-deregulation periods regarding rates by commodity class

[1] For the lowest weight and highest commodity classification.

[2] For highest commodity class.

[3] For lowest weight class.

Sample Statistics

For each route, the following statistics will be generated for the smallest weight category and the highest commodity class.

1. $R_{i,j}$ = mean rate before deregulation ($i=0$) and after deregulation ($i=1$) for intrastate ($j=0$) and interstate ($j=1$) rates.

2. $S_0 = \frac{R_{0,0}}{R_{0,1}}$

   and

   $S_1 = \frac{R_{1,0}}{R_{1,1}}$

3. $S = \frac{S_0}{S_1}$

4. $C_{i,j}$ = mean percentage rate change per month before deregulation ($i=0$) and after deregulation ($i=1$) for intrastate ($j=0$) and interstate ($j=1$) rates.

5. $D_0 = \frac{C_{0,0}}{C_{0,1}}$

   and

   $D_1 = \frac{C_{1,0}}{C_{1,1}}$

6. $D = \frac{D_0}{D_1}$

7. $T_{i,j}$ = mean time between rate changes before deregulation ($i=0$) and after deregulation ($i=1$) for intrastate ($j=0$) and interstate ($j=1$) rates.

8. $U_0 = \frac{T_{0,0}}{T_{0,1}}$

and

$$U_1 = \frac{T_{1,0}}{T_{1,1}}$$

9. $$U = \frac{T_0}{T_1}$$

These statistics are intended to highlight rate levels and the stability of rates in the pre- and post-deregulation periods. As with some of the graphical analyses, interstate rates are employed as a control.

Regression Analysis

Regression analysis is employed for the multivariate analysis of rate levels and variations. In each model the intrastate rate per hundredweight (RATE) is the dependent variable. The explanatory variables are summarized in Table 6 and the rationale for each is discussed below.

The data series spans time as well as various cross sections. The cross sections include the various rate bases (corresponding to individual carrier rates) and routes. An argument could be made that each commodity/shipment size pair also constitutes a cross section. Given this level of complexity, a modified covariance analysis approach was felt to be the only practical means of accounting for variations across cross-sectional units and time-periods. With covariance analysis each cross section/time category is represented by a unique configuration of binary variables. The basic idea behind this approach is that the differences between each cross section/time category may be captured by allowing the intercept to vary.[7] Modifications in the approach were necessary to avoid having so many binary

Table 6. Variable Definitions

Variable	Definition
RATE	rate per hundred weight
CARi	binary variable equal to 1 if the ith carrier, 0 otherwise.
FUEL	per gallon retail cost of diesel fuel in state.
YRi	binary variable equal to 1 if the year 19, 0 otherwise.
CLi	binary variable equal to 1 if commodity class i, 0 otherwise.
DEREG	binary variable equal to 1 if deregulation in effect, 0 otherwise.
WEIGHT	mean weight allowed to be eligible for rate.
UNEMP	state unemployment rate.
PROFF	proportion of distance for the route not on a U.S. Interstate as the Florida Turnpike.
DOFF	distance from nearest interstate or Florida Turnpike of smaller route endpoint.
RURAL	binary variable equal to 1 if a rural-urban route, 0 if an urban-urban route (the rural-urban routes are A4, A6, A7, A8, A9, A10, A11, A12, F1, F3, F4, F7, F8, F11, F14, F16, and F18).
D_variable	denotes interaction term between DEREG and another variable.

variables that the X'X matrix would be difficult to invert. The modifications are as follows:

1. Annual, rather than monthly binary variables are specified (YRi).
2. In the model route-to-route variation in rates is captured by accounting for differences in distance (DIS) and the proportion of the route which is not on a U.S. Interstate or the Florida Turnpike (PROFF), rather than by allowing both DIS and PROFF and the intercept to vary. This method is adopted on the premise that the intercept is not a function of the route.[8]

Specific binary variables are specified for each rate base or carrier (CARi), and commodity class (CLi), and shipment size is treated as one continuous variable (WEIGHT) set to the midpoint of the weight category.

Fuel costs (FUEL) are included as an indicator of variations in input costs to motor carriers. An index capturing variations in the entire range of input costs would be preferable. However, no such ideal measure is known to exist. It is felt by the authors that FUEL is a reasonable proxy for input costs, particularly given the short (monthly) observation periods. On the demand side the rate of unemployment (UNEMP) is specified to capture shifts in the demand for carriage. UNEMP is, in fact, a proxy for the state's output of goods and service. The close relationship between aggregate output and the demand for carriage is well extablished (e.g. see Wilson, pp. 3-7). A direct measure of aggregate output at the state level on a monthly basis is not available.

To investigate differences in the effects of the independent variables on R before and after deregulation, various interaction terms with DEREG are specified. These are: D__UNEMP, D__FUEL, D__WEIGHT, D__CLi, D__DIS, and D__PROFF.

Employing these variables and the quantity of freight (Q), a structural model may be specified as follows:

(1) $Q^D = f(RATE^D, UNEMP, YRi, CLi)$

and

(2) $Q^S = g\ (RATE^S, CARi, FUEL, YRi, WT, DIS, PROFF)$
where D,S are superscripts denoting demand and supply, respectively.

Unfortunately, reliable data on Q are not available. Therefore, it is not possible to estimate a structural model (i.e. estimating D and S in Figure 3) or even a standard reduced form model (i.e. estimating point e in Figure 3). It is possible, however, to estimate the rate level, R, without the quantity, Q, being specified (equivalent to estimating OR in Figure 3). The estimate of OR is derived as follows:

At equilibrium (e):

(3) $RATE^D = RATE^S = RATE$

and

(4) $Q^D = Q^S = Q$,
substituting (3) and (4) into (1) and (2)

(5) $f(RATE, UNEMP, YRi, CLi) = g(RATE, CARi, FUEL, WT, DIS, PROFF) = Q$
subtracting f(RATE, UNEMP, YRi, CLi) from g(RATE, CARi, FUEL, WT, DIS, PROFF) we get the implicit form.

(6) $f(RATE, UNEMP, YRi, CLi) - g(RATE, CARi, FUEL, WT, DIS, PROFF) = 0$
and redefining f-g as F

(6) $F(RATE, UNEMP, YRi, CLi, CARi, FUEL, WT, DIS, PROFF) = 0$, where

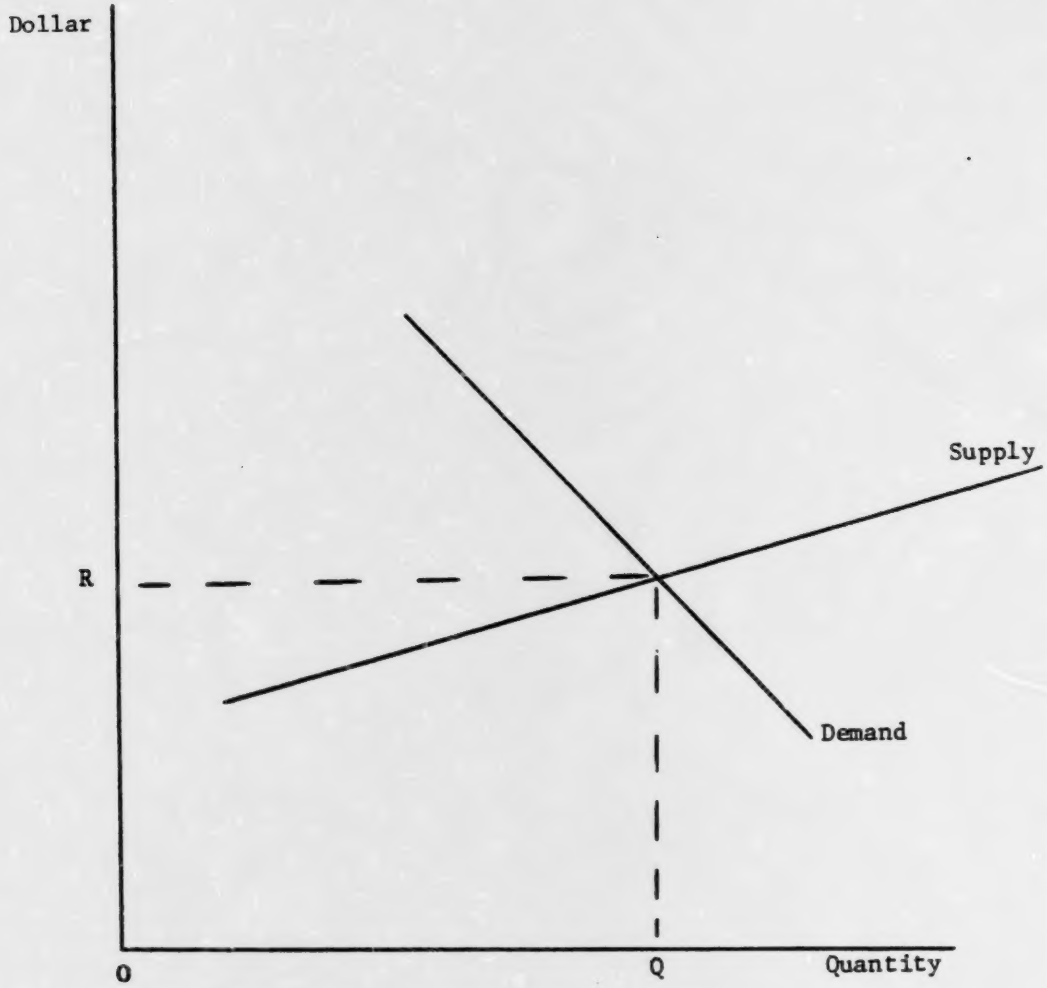

Figure 3. Demand and supply for trucking services

the arguments of F are all of the arguments in f and g. Finally, assuming that F can be solved explicitly for one of its arguments, RATE, we get:

(7) RATE = F*(UNEMP, YRi, CLi, CARi, FUEL, WT, DIS, PROFF).

A major problem with respect to the estimation of F* is that the literature provides little or no guidance regarding the correct functional form. Blair, Kasserman, and McClave experimented with several functional forms. They found the linear and semi-log (i.e. dependent variable expressed as a natural log) forms to be superior. They reported, however, that their basic results were robust across all alternative specifications. Following this lead, in the current study the linear form will be relied upon primarily, with some experimentation regarding the semi-log form.

Data

Unfortunately there are no clear guidelines for selecting the traffic lanes, the sample period, etc. for the current study. Rather data selection must be predicated upon what appears to be a reasonable strategy. In the following few pages the criteria employed to select the sample will be described. The reader should keep in mind that the sample is not a random sample. Rather, it is a sample selected to be representative of the universe of freight rates. Throughout much of the analysis, however, the sample is treated as though it were random. While a random sample and a representative sample should have similar properties, treating the latter as though it were the former is not strictly valid.

Sample Period

It was necessary to include a sufficient period before and after deregulation to encompass the entire transition from regulation to deregulation. In Arizona, a date two and one half years, and in Florida one and one half years prior to deregulation was decided upon for the starting time, and rates were collected through the early fall of 1984. Therefore, the sample periods are: Arizona - January 1980 to October 1984, and Florida - January 1979 to October 1984.

In Arizona by January 1980 the possibility (but not certainty) of deregulation was apparent. Arizona S.B. 1176 had been conditionally enacted in 1979, but required a state referendum (November 1980) to become law. Moreover, even if the referendum did pass, the onset of deregulation was sufficiently remote to preclude meaningful transactional adjustments by carriers or shipper/receivers. In Florida the sufficiency of the one and one half year lead time before deregulation is clear. Deregulation came as a complete surprise to almost everyone, therefore little or no transitional adjustments occurred before July 1980, much less by January 1979.

The ending date for the sample period, October 1984, was as late as could be accomodated given the time frame for completion of the study. It is felt, however, that October 1984 gives sufficient time since deregulation to allow for most short run adjustments. In Arizona some of the transition would have occurred prior to deregulation, thanks to the one and one half year period from November 1980 to July 1982 when the coming of deregulation was a certainty. In Florida, however, virtually all of the transition occurred after the onset of deregulation. It is also probable that the transition took somewhat longer in Florida as carriers delayed changes in hopes (or in fear) of a reversal of deregulation or grouped for new operational strategies in response to the sudden onset of deregulation. Nevertheless, four years (July 1980 to October 1984) should be sufficient for most short run responses to have occurred.

Traffic Lane Selection

The basic strategy governing the selection of traffic lanes was to seek variation with respect to:

1. areas of the state
2. length of haul
3. size of communities being served
4. proportion of the route on U.S. Interstate or Florida Turnpike, and
5. traffic volume

Ideally traffic lanes running from urban to urban areas, urban to rural/small community, and rural/small community to rural/small community should be included. No traffic lanes of the last type were included, however, owing to the very small volumes of freight on such routes. While rates could have been obtained for these traffic lanes, most are paper (i.e. unused) rates of questionable value to the study. Twelve traffic lanes in Arizona and twenty lanes in Florida were selected. They are listed below and depicted in Figures 4 and 5:

Arizona Traffic Lanes

Lane number	Endpoints
A1	Phoenix - Tucson
A2	Phoenix - Nogales
A3	Phoenix - Yuma

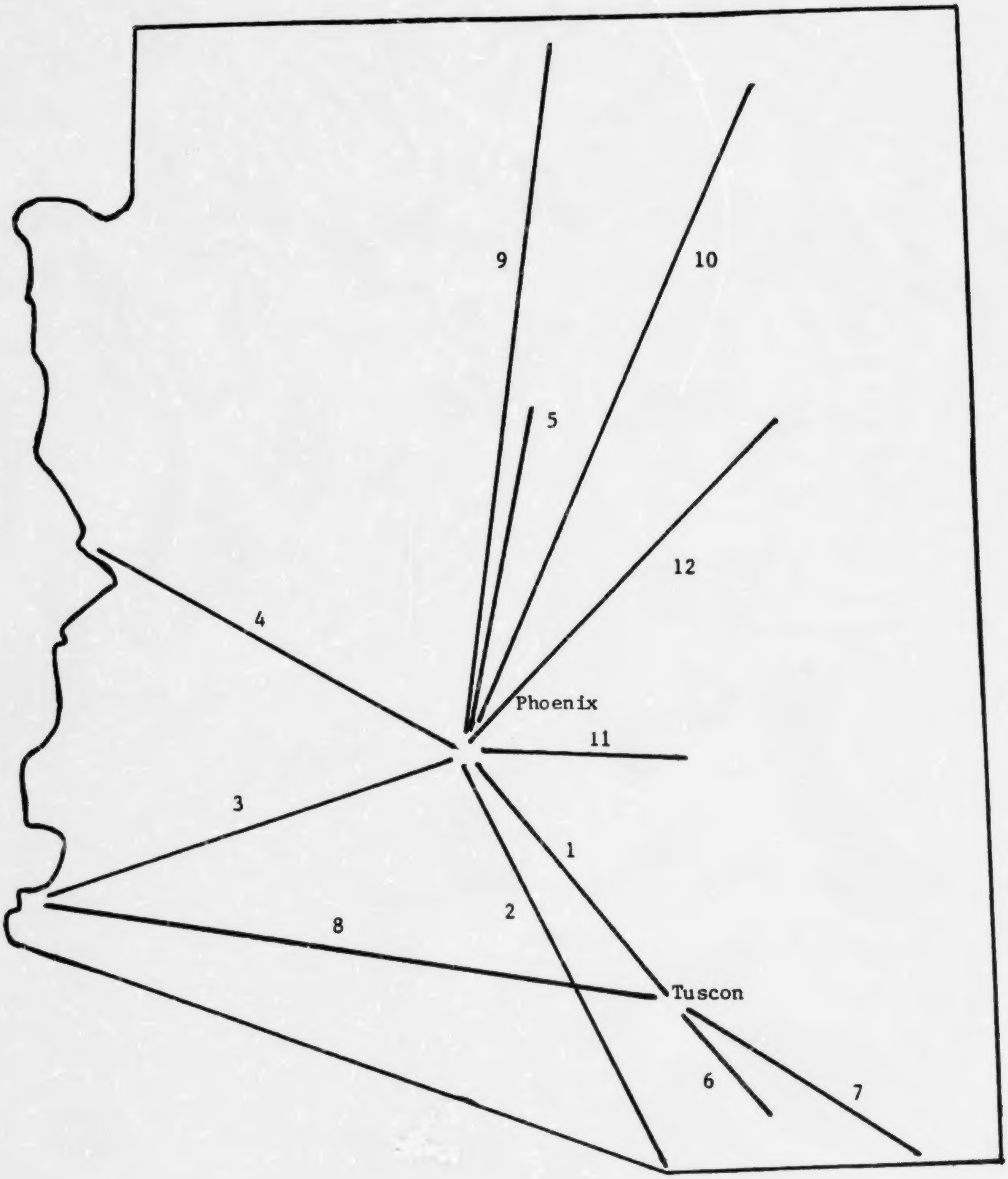
9
10
5
12
4
Phoenix
11
3
1
2
8
Tuscon
6
7

Figure 4. Routes Employed in Arizona Deregulation Rate Study

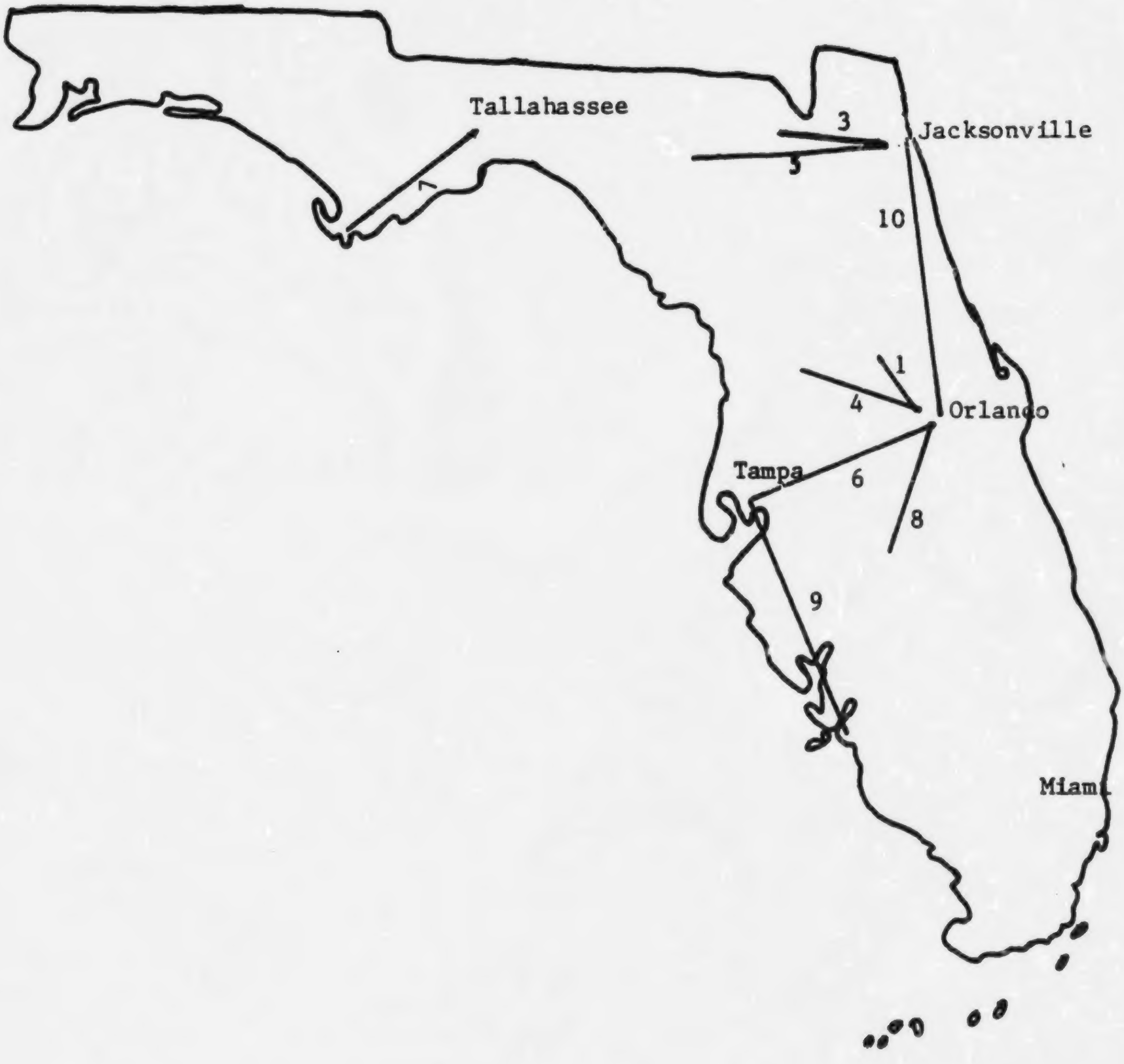
Tallahassee
3
Jacksonville
5
10
1
4
Orlando
Tampa
6
8
9
Miami

Figure 5a. Routes 1-10 employed in Florida deregulation rate study

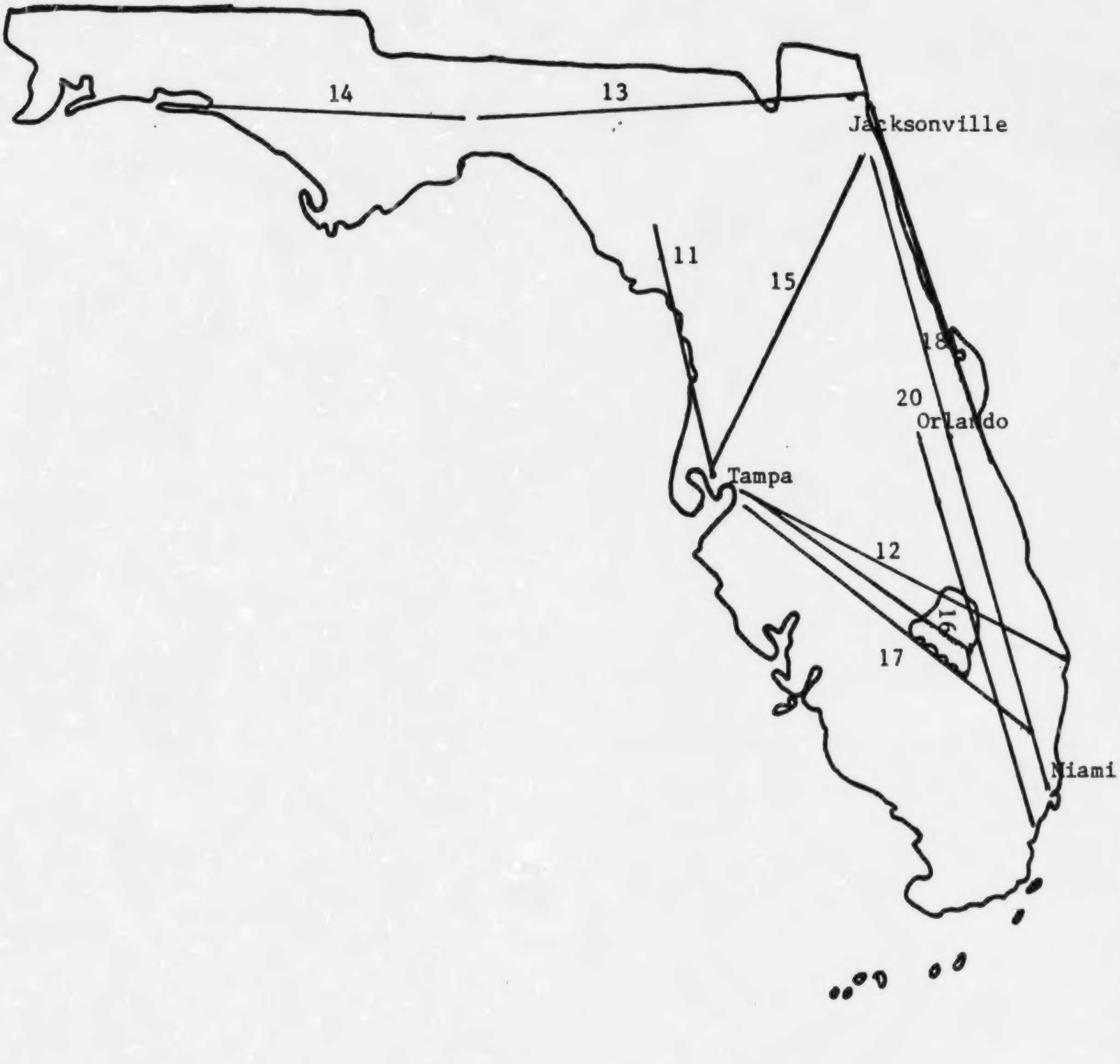
14
13
Jacksonville
11
15
18
20
Orlando
Tampa
12
16
17
Miami

Figure 5b. Routes 11-20 employed in Florida deregulation rate study

Arizona Traffic Lanes

Lane number	Endpoints
A1	Phoenix - Tucson
A2	Phoenix - Nogales
A3	Phoenix - Yuma
A4	Phoenix - Lake Havasu City
A5	Phoenix - Flagstaff
A6	Tucson - Sierra Vista
A7	Tucson - Douglas
A8	Tucson - Yuma
A9	Phoenix - Page
A10	Phoenix - Kayenta
A11	Phoenix - Globe
A12	Phoenix - Joseph City

Florida Traffic Lanes

Lane number	Endpoints
F1	Orlando - Mount Dora
F2	Tampa - Lakeland
F3	Jacksonville - Mcclenney
F4	Orlando - Wildwood
F5	Jacksonville - Lake City
F6	Orlando - Tampa
F7	Tallahassee - Apalachicola
F8	Orlando - Avon Park
F9	Tampa - Fort Myers
F10	Jacksonville - Orlando
F11	Tampa - Cross City
F12	Tampa - West Palm Beach
F13	Jacksonville - Tallahassee
F14	Tallahassee - Fort Walton Beach
F15	Jacksonville - Tampa
F16	Tampa - Belle Galde
F17	Tampa - Fort Lauderdale
F18	Jacksonville - Sebastian
F19	Orlando - Miami
F20	Jacksonville - Miami

Commodity Classes

For each traffic lane, rates for a variety of commodities were collected. This task was greatly eased by the fact that, in both Arizona and Florida, rates are still typically quoted using the standard commodity classifications. In each state, the researchers consulted with local tariff experts to obtain that range of classifications which best typified freight in that state. Emphasis in this regard was on general freight rather than bulk goods or other commodities requiring highly specialized transportation equipment. This was done as it was felt that the impacts of deregulation on specialized carriers would be slight, at least in the short run.[10] The commodity classifications selected were:

in Arizona

#60 #70 #85 #100

in Florida

#65 #70 #77.5 #100 #125.

A brief listing of the commodities covered under each classification are listed in Table 7.

Shipment Sizes

As with commodities, a range of shipment sizes were selected. Some differences between the categories commonly used in Arizona and Florida were found. These are reflected in the categories employed for the study:

Table 7. Commodities Categorized Within Commodity Classes #60, #65, #70, #77.5, #85, #100, and #125

Commodity Class	Representative Commodities
#60	Canned fruit and vegetables, glues (adhesives), alcohol in bulk, aluminum (plate or sheet), plastic bags (film), electrical wire, brass, bronze, copper, castings or forgings, bars, rods, billets, modeling clay, compounds (tree or weed killers), values (iron or steel), hand portable fire extinguishers and compound, insecticide, sheet plastic (rigid).
#65	Aluminum (plate or sheet), anchors, assemblies, bats (aluminum), boilers, brake linings, bumper fittings, fig bars, hatch covers, lumber, paper, roasters, shot, tiles, wallboard.
#70	Electric welders, glassware, batteries (electric storage), electric motors of 5 lbs. each, piece goods (woven), AG plows, used auto tractor parts, bakery goods, china, stoneware, linoleum, hardware, printed matter, radioactive marterials, recordings (disc type), tools (hand).
#77.5	Adhesive, almanacs, aluminum, castings, circulars, croquet sets, cultivators, drills or seeders, dumbbells, flower pots, forks, golf balls, handles, hoes, hooks, lumber, paper sheets, phosphoric acid.
#85	Prepared food, machinery, machine parts, power pumps, drugs, medicines, toilet preparations, piece goods (knit), baseballs, gas or electric ranges (cooking), air conditioner in carton or crate, chemicals, cigars, cigarettes, telephones, fireplace grates, steel file cabinets, light fixtures (fluorescent), compressors (air, gas, liquid), lawn mowers.
#100	Personal effects (household goods), games or toys, 6-12 lbs. per cubic foot density, furniture (metal or wood), batteries, loudspeakers in cabinets, clothing (not on racks or hangers), dry goods, aluminum articles, semi-conductors, firearms, carpet, fluorescent lamp tubes, alcoholic liquor, dishwashers, washing machines, machinery (setup, loose or on skids), meats (fresh, frozen), pianos, sheet steel articles (not nested), blank video tapes.
#125	Blankets, cameras, clamps or couplings, clothing (on hangers or racks), cushions, cutters, decoys, dog chews, fishing rods, harness, housings (shrouds or hoods), kennels, landing gears, screen doors, shutters, skylights, turrets, waste baskets, water coolers.

Arizona:

- under 1,000 pounds
- 1,000 pound minimum
- 2,000 pound minimum
- 5,000 pound minimum
- 10,000 pound minimum

Florida:

- under 500 pounds
- 500 pound minimum
- 1,000 pound minimum
- 2,000 pound minimum
- over 5,000 pounds

Carriers

Under deregulation, any carrier is free to enter and leave any market at will. As such, it is impossible to gather data on rates for all carriers serving a given traffic lane. However, it is possible to collect rates on those carriers serving lanes on a continuous basis. This is true because these firms have continued, almost without exception, to publish rates. It should be noted that these publications are often less formal than the tarrifs familiar in regulated jurisdictions. Nevertheless, they do constitute legitimate price lists for the firm. This is not to say, however, that shipper/receivers cannot secure discounts if they are willing to invest the resources to negotiate and if they possess sufficiently attractive freight. Rather, the published rates are those most typically charged to the majority of the users.

In Arizona, rates for 18 carriers were gathered. These ranged from very large firms operating in several areas of the state to small carriers serving only a handful of routes. In Florida, rates for the four largest intrastate carriers were collected. These carriers operate on all of the routes examined in the study.

Sources for Rates

Two firms were employed to assist the researchers in gathering rates: Phoenix Traffic Service, Inc. in Arizona and Downey and Company, Inc. in Florida. These firms act as consultants and freight auditors for a wide range of shipper/receivers and carriers in each state. As such, they are extremely familiar with the rates in force, including any fuel or other surcharges; the carriers; and the types of freight. This wealth of "hands on" experience was invaluable in ensuring that the rate data would be as complete and accurate as possible.[9]

A summary of the rate data collected is presented in Table 8. The number of observation in the samples are 49,967 for Arizona and 105,500 for Florida.

RESULTS

Comparison of Pre- and Post-Deregulation Rate Levels and Stability

In Tables 9 and 10 are presented the pre- and post-deregulation mean rates available per hundredweight for the smallest shipment weight and the highest commodity classification (i.e. under 1000 pounds and commodity class 100 in Arizona, and under 500 pounds and commodity class 125 in Flor-

Table 8. Summary of Rate Data

	Arizona	Florida
Traffic lanes	A1 Phoenix - Tucson	F1 Orlando - Mount Dora
	A2 Phoenix - Nogales	F2 Tampa - Lakeland
	A3 Phoenix - Yuma	F3 Jacksonville - Macclenney
	A4 Phoenix - Lake Havasu City	F4 Orlando - Wildwood
	A5 Phoenix - Flagstaff	F5 Jacksonville - Lake City
	A6 Tucson - Sierra Vista	F6 Orlando - Tampa
	A7 Tucson - Douglas	F7 Tallahassee - Apalachicola
	A8 Tucson - Yuma	F8 Orlando - Avon Park
	A9 Phoenix - Page	F9 Tampa - Fort Myers
	A10 Phoenix - Kayenta	F10 Jacksonville - Orlando
	A11 Phoenix - Globe	F11 Tampa - Cross City
	A12 Phoenix - Joseph City	F12 Tampa - West Palm Beach
		F13 Jacksonville - Tallahassee
		F14 Tallahassee - Fort Walton Beach
		F15 Jacksonville - Tampa
		F16 Tampa - Belle Glade
		F17 Tampa - Fort Lauderdale
		F18 Jacksonville - Sebastian
		F19 Orlando - Miami
		F20 Jacksonville - Miami
Commodity classes	#60	#65
	#70	#70
	#85	#77.5
	#100	#100
		#125
	under 1,000 pounds[1]	under 500 pounds[1]
Weight categories	1,000 pound minimum	500 pound minimum
	2,000 pound minimum	1,000 pound minimum
	5,000 pound minimum	2,000 pound minimum
	10,000 pound minimum	over 5,000 pounds[2]
	over 10,000 pounds[2]	

[1] "small shipments"

[2] "truckload"

Table 9. Comparison of Pre- and Post-deregulation Rate Levels: Arizona, January 1980 - October 1984.

Route	Mean rate[1] - Pre-deregulation			Mean rate - Post-deregulation		
	Intrastate (A)	Interstate (B)	Ratio (A)/(B)	Intrastate (C)	Interstate (D)	Ratio (C)/(D)
A1	806.5	910.0	0.89	777.4	1380.0	0.56
A2	960.1	981.6	0.98	919.5	1432.0	0.64
A3	885.8	981.6	0.90	923.4	1494.0	0.62
A4	1501.0	1016.0	1.47	880.1	1524.0	0.58
A5	755.1	1018.0	0.74	835.2	1547.0	0.54
A6	758.3	874.4	0.87	714.7	1347.0	0.53
A7	787.9	887.8	0.89	756.9	1309.0	0.58
A8	768.2	1055.0	0.73	940.7	1606.0	0.59
A9	892.4	1144.0	0.78	1079.0	1669.0	0.65
A10	1641.0	3009.0	0.55	1510.0	3468.0	0.44
A11	643.7	1049.0	0.61	681.3	1301.0	0.52
A12	757.5	1089.0	0.70	916.8	1659.0	0.55

[1] Rate per hundredweight for shipments under 1000 pounds and commodity class 100.

Table 10. Comparison of Pre- and Post-deregulation Rate Levels: Florida, January 1979 - October 1984

Route	Mean Rate[1] - Prederegulation			Mean Rate[1] - Postderegulation		
	Intrastate (A)	Interstate (B)	Ratio (A)/(B)	Intrastate (C)	Interstate (D)	Ratio (C)/(D)
F1	492.9	702.7	0.70	483.7	794.6	0.61
F2	531.4	754.3	0.70	521.6	849.4	0.61
F3	567.5	807.1	0.70	557.2	908.8	0.61
F4	606.4	866.1	0.70	595.2	974.4	0.61
F5	615.1	872.8	0.70	603.9	982.6	0.61
F6	648.0	920.2	0.70	636.3	1036.0	0.61
F7	665.2	941.8	0.71	653.2	1060.0	0.62
F8	704.4	999.0	0.71	691.9	1124.0	0.62
F9	800.6	1135.0	0.71	786.3	1275.0	0.62
F10	817.7	1159.0	0.71	803.3	1303.0	0.62
F11	832.2	1178.0	0.71	817.5	1325.0	0.62
F12	845.2	1197.0	0.71	830.3	1346.0	0.62
F13	859.4	1215.0	0.71	844.3	1366.0	0.62
F14	867.4	1228.0	0.71	852.1	1380.0	0.62
F15	908.3	1284.0	0.71	892.2	1443.0	0.62
F16	1026.0	1450.0	0.71	1008.0	1629.0	0.62
F17	665.2	941.8	0.71	653.2	1060.0	0.62
F18	800.6	1135.0	0.71	786.3	1275.0	0.62
F19	832.2	1178.0	0.71	817.5	1325.0	0.62
F20	867.4	1228.0	0.71	852.1	1380.0	0.62

[1] Rate per hundredweight for shipments under 500 pounds and commodity class 125.

ida). The mean intrastate rates are compared to the corresponding interstate rates. The interstate rates are the ones employed for interstate movements in which a carrier moves the cargo over a portion of the entire haul which is entirely within one state. Comparison with these rates is useful as they and the intrastate rates are subject to the much same economic stimuli (i.e. fuel costs, general economic conditions, etc.). However, the interstate ratemaking process were not deregulated. Therefore the interstate rates may be viewed loosely as the control group, the rates to which the treatment (deregulation) was not applied. Figures showing the maximum and minimum intrastate rates and the interstate rates are presented in Appendix 2.

With only one exception, Arizona Route 4, prior to deregulation the intrastate rates are lower than their interstate counterparts. This is not surprising for two reasons. First, interstate rates include a premium to cover the costs and bother of interlining with another carrier. Second, an added premium may exist for reasons akin to the traditional rationale for value-of-service pricing. If the intrastate portion of an interstate haul represents a small share of the total transport cost, the elasticity of demand for that portion should be low. Regardless of the reason for interstate rates tending to be higher, what is of particular interest is the relative movement of the intrastate and interstate rates as the former becomes deregulated.

It is clear from Tables 9 and 10 that interstate rates have risen faster over the sample period. In fact, while the average interstate rate after intrastate deregulation is higher on all routes, for all Florida routes and half of the Arizona routes the average intrastate rate actually falls after deregulation. For all routes the ratio of the average intrastate to the interstate rate is lower subsequent to deregulation.

In Florida the average intrastate rate along all routes fell by about two percent between the pre-deregulation period (January 1979 to June 1980) and the post-deregulation period (July 1980 to October 1984). By contrast, in Arizona the average intrastate rate rose by as much as 22 percent (Route 8) and fell by as much as 41 percent (Route 4) from the pre-deregulation period (January 1980 to June 1982) to the post-deregulation period (July 1982 to October 1984). This indicates that Florida carriers have relied almost exclusively upon general rate changes, whereas Arizona carriers have adjusted rates on a route-by-route basis. It seems likely that these difference reflect, at least in part, differences in the consistency of the impact of regulation in the two states across routes. Evidently the rates from Phoenix to Lake Havasu City (Route 4) required radical cuts in the face of free competition, while the Tuscon to Yuma route (Route 8) could sustain considerable rate increases.

Rate stability is measured in two ways: the mean percentage month-to-month rate change, and the average interval in months between rate changes. As with the above analysis of rate levels, comparisons are made to the same statistics for interstate rates. The reader should be reminded that the intrastate rates are the standard, "off-the-shelf" rates used by the carriers. Discussions with carriers, shippers, and brokers confirms that these rates are regularly employed, rather than being sham or "paper" rates. However, this does not mean that since deregulation (and surreptitiously under regulation) alternative rates may not be negotiated. Rather what has been measured is the variability of readily available freight rates.

Since deregulation, the mean percentage change in freight rates has declined along every route (Tables 11 and 12). Moreover, on 30 of the 32 routes in the study, the relative mean percentage change in rates of intra-

Table 11. Pre- and Post-Deregulation Measures of Rate Stability: Arizona, January 1980 - October 1984.

	Mean month-to-month absolute percentage change in freight rate[1]-pre-deregulation			Mean month-to-month absolute percentage change in freight rate[1]-post-deregulation			Mean number of months between rate changes-pre-deregulation			Mean number of months between rate changes-post-deregulation		
Route	Intrastate (A)	Interstate (B)	Ratio (A)/(B)	Intrastate (C)	Interstate (D)	Ratio (C)/(D)	Intrastate (E)	Interstate (F)	Ratio (E)/(F)	Intrastate (G)	Interstate (H)	Ratio (G)/(H)
A1	1.834	1.860	0.99	0.1315	0.9019	0.15	09.462	4.429	2.14	37.80	4.800	7.88
A2	1.222	1.855	0.66	0.1589	1.190	0.13	10.40	3.000	3.47	47.80	3.000	15.93
A3	1.339	1.855	0.72	0.1859	0.9590	0.19	11.50	3.714	3.10	38.00	4.800	7.92
A4	2.482	1.862	1.33	0.4341	1.108	0.39	11.50	3.000	3.83	20.20	6.250	3.23
A5	1.049	1.858	0.56	0.4217	0.9302	0.45	15.25	3.000	5.08	32.67	4.800	6.81
A6	1.595	1.860	0.86	0.09650	1.034	0.09	11.83	3.000	3.94	38.50	5.000	7.70
A7	1.549	3.599	0.43	0.0587	1.121	0.05	11.57	3.250	3.56	50.00	4.800	10.40
A8	0.5550	1.857	0.30	0.3778	0.9514	0.40	27.00	3.000	9.00	29.00	4.800	6.04
A9	0.936	1.856	0.50	0.5708	1.187	0.48	20.00	3.000	6.67	34.00	3.000	11.33
A10	0.6340	1.894	0.33	0.4896	2.437	0.20	20.00	5.000	4.00	19.67	4.800	4.10
A11	0.7173	1.158	0.62	0.3642	0.7737	0.47	04.062	7.000	0.58	43.33	5.000	8.67
A12	1.181	3.098	0.38	0.9678	0.9696	1.00	15.41	3.250	4.74	42.75	4.800	8.91

[1] Rate per hundredweight for shipment under 1000 pounds and commodity class 100.

Table 12. Pre- and Post-Deregulation Measures of Rate Stability: Florida, January 1979-October 1984.

	Mean month-to-month absolute percentage change in freight rate[1]-pre-deregulation			Mean month-to-month absolute percentage change in freight rate[1]-post-deregulation			Mean number of months between rate changes-pre-deregulation			Mean number of months between rate changes-post-deregulation		
Route	Intrastate (A)	Interstate (B)	Ratio (A)/(B)	Intrastate (C)	Interstate (D)	Ratio (C)/(D)	Intrastate (E)	Interstate (F)	Ratio (E)/(F)	Intrastate (G)	Interstate (H)	Ratio (G)/(H)
F1	1.886	1.521	1.240	0.1440	0.9770	0.1474	24.43	4.545	5.375	13.00	4.00	3.25
F2	1.879	1.320	1.423	0.1460	0.9690	0.1507	24.43	4.545	5.375	13.00	4.00	3.25
F3	1.871	1.313	1.425	0.1480	0.9560	0.1548	24.43	4.545	5.375	13.00	4.00	3.25
F4	1.875	1.335	1.404	0.1440	0.9390	0.1534	24.43	4.545	5.375	13.00	4.00	3.25
F5	1.866	1.313	1.421	0.1460	0.9420	0.1550	24.43	4.545	5.375	13.00	4.00	3.25
F6	1.857	1.329	1.397	0.1460	0.9240	0.1580	24.43	4.545	5.375	13.00	4.00	3.25
F7	1.856	1.262	1.471	0.1460	0.9200	0.1587	24.43	4.545	5.375	13.00	4.00	3.25
F8	1.845	1.320	1.398	0.1450	0.9070	0.1599	24.43	4.545	5.375	13.00	4.00	3.25
F9	1.837	1.333	1.378	0.1460	0.8940	0.1633	24.43	4.545	5.375	13.00	4.00	3.25
F10	1.837	1.281	1.434	0.1470	0.8840	0.1663	24.43	4.545	5.375	13.00	4.00	3.25
F11	1.832	1.233	1.486	0.1450	0.8840	0.1640	24.43	4.545	5.375	13.00	4.00	3.25
F12	1.836	1.301	1.411	0.1480	0.8780	0.1686	24.43	4.545	5.375	13.00	4.00	3.25
F13	1.828	1.263	1.447	0.1470	0.8800	0.1670	24.43	4.545	5.375	13.00	4.00	3.25
F14	1.833	1.355	1.353	0.1480	0.8800	0.1682	24.43	4.545	5.375	13.00	4.00	3.25
F15	1.827	1.307	1.400	0.1460	0.8780	0.1663	24.43	4.545	5.375	13.00	4.00	3.25
F16	1.825	1.293	1.411	0.1470	0.8690	0.1692	24.43	4.545	5.375	13.00	4.00	3.25
F17	1.856	1.262	1.471	0.1460	0.9200	0.1587	24.43	4.545	5.375	13.00	4.00	3.25
F18	1.837	1.333	1.378	0.1460	0.8940	0.1633	24.43	4.545	5.375	13.00	4.00	3.25
F19	1.832	1.233	1.486	0.1450	0.8840	0.1640	24.43	4.545	5.375	13.00	4.00	3.25
F20	1.833	1.355	1.353	0.1480	0.8800	0.1682	24.14	4.545	5.311	13.00	4.00	3.25

[1] Rate per hundredweight for shipment under 500 pounds and commodity class 125.

state to interstate rates has declined. In other words, along all but two routes, intrastate rates exhibit smaller percentage changes month-to-month relative to interstate rates than they did prior to deregulation. The two exceptions are routes A8 (Tuscon to Yuma) and A12 (Phoenix to Joseph City).

For all but one Arziona route (A10, Phoneix to Kayenta), the frequency of rate changes is lower in the post-deregulation period than in the pre-deregulation period. In contrast, along all Florida routes there is an increased frequency of rate changes since deregulation. Table 12 clearly reveals the aforementioned practice of Florida carriers to make general rate changes. All of the routes have the same frequency of rate changes.

Overall, the analysis of rate stability indicates reductions in both the frequency and size of rate changes in Arizona. In Florida the sizes of the rate changes have also been lowered since deregulation, though at the cost of somewhat more frequent rate changes. The evidence from both states suggests that rate instability has not been a problem since deregulation.

Regression Analysis

Freight Rate Estimation

In Tables 13 and 14, the results of estimating the intrastate freight rates for Arizona and Florida, respectively, are presented. For each state three primary models were estimated, 1A, 2A, and 3A. They differ only in the variable employed to gauge ruralness or "out-of-the-wayness." Models 1B, 2B, and 3B are presented to demonstrate the robustness of the results across an alternative specification. In these models a trend term, rather than annual binary variables, is used. Also, the commodity classes are

Table 13. Freight Rate Regression Results - Arizona.

Independent variable	Dependent Variable: Rate per 100 pounds					
	Model 1A	Model 1B	Model 2A	Model 2B	Model 3A	Model 3B
Intercept	-60.72 (-1.591)	-439.9* (-13.81)	-13.28 (-.3520)	-402.1* (-12.78)	-44.49 (-1.67)	-426.2* (-13.40)
Distance	1.932* (91.31)	1.933* (91.35)	1.632* (64.24)	1.635* (64.35)	1.851* (85.55)	1.853* (85.59)
Weight class	-.01657* (-138.3)	-.01657* (-138.3)	-.01657* (-140.4)	-.01657* (-140.3)	-.01657* (-138.7)	-.01657* (-138.6)
Proportion off interstate	46.19* (11.30)	45.58* (11.14)				
Distance off interstate			.6209* (20.80)	6.167* (20.65)		
Rural-urban route					33.09* (19.93)	32.94* (19.83)
Commodity class 70	60.83* (19.90)		60.83* (20.20)		60.83* (19.94)	
Commodity class 85	158.1* (51.72)		158.1* (52.50)		158.1* (51.84)	
Commodity class 100	251.8* (82.38)		251.8* (83.62)		251.8* (82.57)	
Commodity class continuous variable		6.321* (88.60)		6.321* (89.92)		6.321* (88.81)
Fuel cost	2.331* (9.350)	2.450* (10.19)	2.269* (9.241)	2.472* (10.43)	2.367* (9.523)	2.494* (10.40)
Unemployment rate	9.292* (4.936)	-2.902 (-2.370)	9.180* (4.950)	-2.776 (-2.300)	9.392* (5.001)	-2.629 (-2.152)
Year 1980	-51.49* (-8.802)		-50.67* (-8.792)		-52.02* (-8.914)	
Year 1981	9.470 (1.674)		10.16 (1.823)		8.90 (1.577)	
Year 1983	-13.81* (-4.627)		-13.14* (-4.469)		-13.66* (-4.586)	
Year 1984	-14.26* (-2.531)		-12.74 (-2.295)		-13.94* (-2.480)	

Continued

Table 13. Freight Rate Regression Results - Arizona. Continued.

Independent variable	Dependent Variable: Rate per 100 pounds					
	Model 1A	Model 1B	Model 2A	Model 2B	Model 3A	Model 3B
Trend Term		3.362* (16.80)		3.246* (16.46)		3.359* (16.82)
Company 1	-98.96* (-26.56)	-99.15* (-26.60)	-102.6* (-28.43)	-102.7* (-28.44)	-126.9* (-15.01)	-92.49* (-24.69)
Company 2	-152.0* (-40.89)	-152.7* (-41.05)	-140.4* (-38.18)	-141.1* (-38.34)	-150.1* (-40.36)	-150.7* (-40.53)
Company 3	-132.0* (-27.22)	-132.9* (-27.39)	-124.7* (-26.01)	-125.6* (-26.19)	-161.4* (-31.59)	-162.3* (-31.74)
Company 4	-260.4* (-68.46)	-262.4* (-68.91)	-251.4* (-66.91)	-253.3* (-67.35)	-258.7* (-68.05)	-260.6* (-68.51)
Company 5	-207.7* (-58.27)	-209.1* (-58.63)	-209.5* (-59.65)	-210.8* (-59.98)	-207.6* (-58.39)	-209.0* (-58.74)
Company 6	-92.16* (-21.59)	-91.98* (-21.54)	-111.3* (-25.61)	-111.1* (-25.54)	-116.8* (-25.30)	-116.8* (-25.27)
Company 7	-192.2* (-44.40)	-193.4* (-44.64)	-193.4* (-45.32)	-194.5* (-45.55)	-195.0* (-45.04)	-196.1* (-45.27)
Company 8	-74.44* (-22.57)	-74.41* (-22.56)	-90.13* (-26.73)	-90.04* (-26.69)	-74.18* (-22.81)	-74.24* (-22.81)
Company 9	-201.2* (-39.57)	-202.3* (-39.83)	-191.4* (-38.33)	-192.6* (-38.59)	-198.5* (-39.08)	-199.8* (-39.35)
Company 10	-169.7* (-39.31)	-169.8* (-39.33)	-143.3* (-32.00)	-143.6* (-32.05)	-147.4* (-32.44)	-147.5* (-32.45)
Company 11	-96.05* (-15.71)	-95.91* (-15.68)	-39.73* (-6.676)	-40.13* (-6.738)	-97.03* (-16.35)	-97.15* (-16.36)
Company 13	-136.5* (-16.13)	-137.9* (-16.42)	-129.6* (-15.61)	-131.0* (-15.88)	-126.9* (-15.06)	-128.1* (-15.25)
Company 14	-206.5* (-36.70)	-206.8* (-36.73)	-189.8* (-33.80)	-190.1* (-33.83)	-245.3* (-42.90)	-245.3* (-42.89)
Company 15	-262.5* (-55.85)	-264.3* (-56.23)	-247.6* (-53.24)	-249.4* (-53.62)	-260.7* (-55.55)	-262.6* (-55.94)
Company 16	45.26* (11.47)	43.45* (11.01)	57.39* (14.76)	55.57* (14.28)	46.21* (11.76)	44.36* (11.28)

Continued

Table 13. Freight Rate Regression Results - Arizona. Continued.

Independent variable	Dependent Variable: Rate per 100 pounds Model 1A	Model 1B	Model 2A	Model 2B	Model 3A	Model 3B
Company 17	-239.5* (-62.73)	-240.2* (-62.89)	-240.5* (-64.00)	-241 (-64..	-240.4* (-64.17)	-241.1* (-63.32)
Company 18	134.2* (22.48)	134.8* (22.58)	80.70* (13.29)	81.63* (13.44)	131.5* (22.06)	132.3* (22.18)
Deregulated (DEREG)	594.4* (13.67)	289.3* (5.935)	546.4* (12.74)	262.2* (5.454)	575.0* (13.25)	273.3* (5.618)
I-Distance[1]	-0.6657* (-27.18)	-0.6683* (-27.27)	-0.4778* (-16.86)	-0.4818* (-16.99)	-0.5997* (-24.04)	-0.6021* (-24.13)
I-Weight[1]	.001016* (7.360)	.001014* (7.339)	.001011* (7.433)	.001009* (7.411)	.001013* (7.351)	.001010* (7.330)
I-Proportion off interstate	-32.57* (7.090)	-32.05* (-6.974)				
I-Distance off interstate			-.05437 (-1.605)	-.0533 (-1.575)		
I-Rural-urban route					-18.91* (-11.39)	-19.00* (-11.44)
I-Commodity class 70	-1.161 (-.3290)		-1.161 (-.3340)		-1.161 (-.3300)	
I-Commodity class 85	-4.022 (-1.140)		-4.022 (-1.157)		-4.022 (-1.143)	
I-Commodity class 100	-5.495 (-1.558)		-5.495 (-1.581)		-5.495 (-1.561)	
I-Commodity class continuous variable		-.1434 (-1.742)		-.1434 (-1.768)		-.1434 (-1.746)
I-Fuel cost	-2.604* (8.615)	-2.468* (-8.420)	-2.5468* (-8.552)	-2.488* (-8.614)	-2.634* (-8.737)	-2.504* (-8.567)
I-Unemployment rate	-12.20* (-5.528)	15.12* (8.044)	-11.23* (-5.165)	15.10* (8.149)	-12.08* (-5.485)	15.00* (7.994)
I-Company 1	-73.35* (-14.08)	-74.36* (-14.27)	-79.12* (-15.53)	-80.14* (-15.73)	-79.57* (-15.25)	-80.67* (-15.46)
I-Company 3	-78.83* (-11.61)	-78.54* (-11.56)	-95.28* (-14.24)	-94.87* (-14.17)	-54.39* (-7.769)	-54.02* (-7.714)

Continued

Table 13. Freight Rate Regression Results - Arizona. Continued.

Independent variable	Dependent Variable: Rate per 100 pounds					
	Model 1A	Model 1B	Model 2A	Model 2B	Model 3A	Model 3B
I-Company 6	-99.00*	-100.6*	-89.12*	-90.63*	-75.95*	-77.36*
	(-17.27)	(-17.53)	(-15.48)	(-15.73)	(-12.67)	(-12.90)
I-Company 8	-106.7*	-104.9*	-115.7*	-113.8*	-107.3*	-105.4*
	(-18.03)	(-17.76)	(-19.47)	(-19.19)	(-18.24)	(-17.95)
I-Company 10	-26.93*	-27.37*	-35.99*	-36.32*	-43.39*	-43.96*
	(-4.179)	(-4.246)	(5.520)	(-5.568)	(-6.551)	(-6.634)
I-Company 11	-51.89*	-53.98*	-111.2*	-112.6*	-49.39*	-50.86*
	(-7.117)	(-7.400)	(-15.64)	(-15.83)	(-6.883)	(-7.136)
I-Company 13	-51.79*	-51.10*	-46.96*	-46.33*	-57.69*	-57.35*
	(-5.400)	(-5.357)	(-4.983)	(-4.942)	(-6.011)	(-6.007)
I-Company 14	100.8*	102.6*	97.58*	99.31*	128.3*	130.0*
	(10.43)	(10.61)	(10.21)	(10.38)	(13.20)	(13.37)
F value	3259*	3840*	3391*	3993*	3279*	3863*
R^2	.75	.75	.76	.76	.75	.75
Number of observations	49,967	49,967	49,967	49,967	49,967	49,967

Note: "I-" denotes interaction term with DEREG.

t ratios in parentheses.

* significantly different from zero at the .01 level.

Table 14. Freight Rate Regression Results - Florida.

Independent variable	Dependent Variable: Rate per 100 pounds					
	Model 1A	Model 1B	Model 2A	Model 2B	Model 3A	Model 3B
Intercept	235.4 (32.05)	16.52* (-3.658)	229.6* (31.16)	-22.29* (-4.920)	235.4* (31.94)	-16.51* (-3.632)
Distance	1.005* (215.0)	1.005* (213.9)	1.015* (213.9)	1.015* (212.8)	.9976* (203.7)	.9976* (202.7)
Weight class	-.01160* (-258.1)	-.01160* (-256.9)	-.01160* (-257.3)	-.01160* (-256.0)	-.01160* (-257.6)	-.01160* (-256.3)
Proportion off interstate	-20.42* (-20.00)	-20.42* (-19.90)				
Distance off interstate			-.0549* (-3.001)	-.0549* (-2.986)		
Rural-urban route					-10.46* (-12.75)	-10.46* (-12.68)
Commodity class 70	23.40* (19.44)		23.40* (19.38)		23.40* (19.40)	
Commodity class 77.5	57.23* (47.55)		57.23* (47.39)		57.23* (47.45)	
Commodity class 100	159.3* (132.3)		159.3* (131.9)		159.3* (132.1)	
Commodity class 125	269.5* (223.9)		269.5* (223.2)		269.5* (223.5)	
Commodity class continuous variable		4.491* (261.3)		4.491* (260.4)		4.491* (260.7)
Fuel cost	-.02222 (-.4290)	-.1811* (-5.933)	-.02222 (-.4280)	-.1811* (-5.913)	-.02222 (-.4280)	-.1811* (-5.920)
Unemployment rate	-.7541 (-1.769)	-11.40* (-37.36)	-.7541 (-1.763)	-11.40* (-37.23)	-.7541 (-1.766)	-11.40* (-37.28)
Year 1979	-20.32* (-8.550)		-20.32* (-8.521)		-20.32* (-8.533)	
Year 1981	12.04* (7.425)		12.04* (7.400)		12.04* (7.410)	
Year 1982	23.13* (14.86)		23.13* (14.81)		23.13* (14.83)	

Continued

Table 14. Freight Rate Regression Results - Florida. Continued.

Independent variable	Dependent Variable: Rate per 100 pounds Model 1A	Model 1B	Model 2A	Model 2B	Model 3A	Model 3B
Year 1983	42.12* (25.83)		42.12* (25.75)		42.12* (25.78)	
Year 1984	115.0* (71.92)		115.0* (71.68)		115.0* (71.77)	
Trend Term		2.374* (110.8)		2.374* (110.4)		2.374* (110.5)
Company 2	-10.72* (-9.315)	-12.05* (-10.60)	-10.72* (-9.284)	-12.05* (-10.56)	-10.72* (-9.296)	-12.05* (-10.58)
Company 3	-.9623 (-.8370)	-2.295 (-2.019)	-.9623 (-.8340)	-2.295 (-2.012)	-.9623 (-.8350)	-2.295 (-2.015)
Company 4	29.69* (25.81)	28.35* (24.94)	29.69* (25.72)	28.35* (24.86)	29.69* (25.75)	28.35* (24.89)
Deregulated (DEREG)	-13.33 (-1.003)	9.593 (.9680)	-13.28 (-.9970)	9.639 (.9690)	-13.29 (-.9980)	9.628 (.9680)
I-Distance	-.006945 (-1.007)	-.006945 (-1.002)	-.007042 (-1.007)	-007042 (-1.002)	-.007011 (-.9710)	-.007011 (-.9660)
I-Weight	.0006266* (9.458)	.0006266* (9.411)	.0006266* (9.426)	.0006266* (9.380)	.0006266* (9.439)	.0006266* (9.392)
I-Proportion off Interstate	.1027 (.0680)	.1027 (.06800)				
I-Distance off Interstate			-.0007088 (-.0270)	-.0007088 (-.0260)		
I-Rural-urban route					-.002510 (-.0020)	-.002510 (-.0020)
I-Commodity class 70	-.1526 (-.0860)		-.1526 (-.0860)		-.1526 (-.08600)	
I-Commodity class 77.5	-.3598 (-.2030)		-.3598 (-.2020)		-.3598 (-.2020)	
I-Commodity class 100	-.9947 (-.5600)		-.9947 (-.5590)		-.9947 (-.5590)	
I-Commodity class 125	-2.0. (-1.1		-2.020 (-1.134)		-2.020 (-1.136)	

Continued

Table 14. Freight Rate Regression Results - Florida. Continued.

Independent variable	Dependent Variable: Rate per 100 pounds Model 1A	Model 1B	Model 2A	Model 2B	Model 3A	Model 3B
I-Commodity class continuous variable		-.03310 (-1.305)		-.03310 (-1.301)		-.03310 (-1.303)
I-Fuel cost	.1414 (1.506)	-.1026 (-1.391)	.1414 (1.501)	-.1026 (-1.386)	.1414 (.1503)	-.1026 (-1.388)
I-Unemployment rate	-1.562* (-2.775)	-2.011* (-4.098)	-1.562* (-2.765)	-2.011* (-4.084)	-1.562* (-2.769)	-2.011* (-4.089)
I-Company 2	27.21* (16.50)	26.16* (15.88)	27.21* (16.45)	26.16* (15.83)	27.21* (16.47)	26.16* (15.85)
I-Company 3	20.65* (12.70)	21.98* (13.57)	20.65* (12.66)	21.98* (13.52)	20.65* (12.67)	21.98* (13.54)
I-Company 4	17.45* (10.73)	18.78* (11.59)	14.45* (10.69)	18.78* (11.55)	17.45* (10.71)	18.78* (11.57)
F value	11770*	17440*	11670*	17280*	11710*	17340*
R^2	.77	.77	.77	.77	.77	.77
Number of observations	105,500	105,500	105,500	105,500	105,000	105,000

Note: "I-" denotes interaction term with DEREG.

t ratios in parenthesis.

* significantly different from zero at the .01 level.

respecified as a continuous variable equal to number of the commodity classification. The "B" models are not discussed at length. For both states all of the models are highly significant and explain about three quarters of the squared deviations from the mean. In Appendix 5, the route-by-route estimates for model 1A are presented.

Distance

As would be expected, higher rates are realized on longer routes. The Model 1A estimates indicate that the per hundredweight rate before deregulation rose 1.932 and 1.005 cents per mile in Arizona and Florida, respectively. In both states the distance-rate gradient appears to have lessened since deregulation. The interaction term between distance and DEREG indicates a .6657 cent per mile drop in Arizona and a .006945 cent per mile drop in Florida. It should be noted that only the Arizona estimate is significantly different from zero at the .01 level. The lowering of the distance-rate gradients since deregulation suggests that operational economies have been realized thanks to the release from restrictions on areas and commodities carriers may serve. The dramatic reduction in Arizona is particularly impressive as the onset of deregulation was coincident with a change in the tax structure which should have steepened the distance-rate gradient.

It may be argued by some that the reduction in the distance-rate gradient is the result of increased, possibly ruinous competition, rather than actual increases in operational efficiencies. It would be difficult, however, to explain why this competition has forced a reduction in rates per mile unless distance-related efficiencies are being realized.

Shipment Weight

The parameter estimates corresponding to shipment weight class (WEIGHT) clearly reflect the fact that rates per unit weight decline as total shipment weight increases. The estimates in Model 1A indicate that rates per hundredweight decline by from 1.16 (Florida) to 1.657 (Arizona) cents per 100 pound increase in total shipment size. The estimated parameters associated with the WEIGHT-DEREG interaction term indicate some lowering in the premiums paid for small shipments relative to large shipments. Since deregulation it is estimated that the reduction in per hundredweight rate levels as shipment size increases by 100 pounds is 1.097 cents in Florida and 1.555 cents in Arizona. Therefore the shipper of smaller lots has not suffered relative to those with larger shipments. On the contrary, rates have shifted somewhat in favor of small lot shippers. In Appendix 3, figures showing the ratio of rates for the highest and lowest weight classes are presented.

Remoteness

Probably the most widely held fear regarding motor carrier deregulation is the premise that shipper/receivers in small, out-of-the-way locations will receive service only at exorbitant rates relative to those charged to urban shipper/receivers. The evidence of the current study indicates that this fear is groundless.

Three alternative measures of remoteness were employed: the proportion of the route off a U.S. Interstate or the Florida Turnpike (PROFF)-Models 1A and 1B; the distance from the smaller endpoint community to the nearest U.S. Interstate or the Florida Turnpike (DOFF)-Models 2A and 2B;

and a binary variable equal to one if the route is rural-urban and zero if urban-urban (RURAL)-Models 3A and 3B. Regardless of the model specification, the results indicate the following:

Arizona:

Prior to deregulation a premimum was paid to obtain service to or from remote locations. Since deregulation the premium has been sharply reduced.

Florida:

Prior to deregulation service to remote areas actually commanded lower rates, ceteras paribus, than did urban areas. There has been no appreciable change since deregulation.

The results for Arizona suggest that remote areas may have actually cross-subsidized urban areas. At least, the results indicate larger monopoly profits or greater regulation-induced inefficiencies associated with service to remote than to urban areas. The results for Florida are somewhat puzzling. Remote areas actually enjoy service at lower rates than do urban areas. It may be that the advantages of serving less congested areas in Florida overshadow any inconveniences associated with serving sparsely populated areas. Rural areas in Florida are never far off the beaten path, at least by Arizona standards, and some of Florida's cities have considerable traffic problems, particularly during peak tourist months. Whatever the reasons, however, for the urban rate premium, it is evident that deregulation has not altered the relative rate levels for urban and rural service.

Commodity Classes

The commodity classification system for quoting rates has been maintained by virtually all carriers in both states. As this classification system is based in part on commodity value, with deregulation a moderating in the rate differentials charged across commodity classes was widely anticipated. This was true because cargo value-based pricing (known as value-of-service pricing) has long been thought to be a regulation-induced form of price discrimination. The results, however, indicate no change in the rate structure across commodity classes. For all models and for both states, higher rates are associated with higher commodity classifications before deregulation, with no appreciable changes after deregulation. These results are consistent with recent theoretical works by DeVany and Saving, Salop and Stiglitz, and others demonstrating that value-of-service price structures may exist without regulation. Moreover, Beilock (1985) has shown that a value-of-service structure does exist in the never-regulated trucking market for interstate shipments of Florida produce. In Appendix 4 the ratio of rates for the highest and lowest commodity classes used in the study are presented.

Intercept Term

Intercept shifters were included for each firm (both before and after deregulation) and for all observations after deregulation. Summing the appropriate parameter estimates for each firm/time period combination reveals if and in what direction the intercept shifted after deregulation, By this process, it is evident that the intercept for all Arizona firms increased after deregulation, while those for Florida firms remained essentially constant.

Interpreting these results is somewhat difficult. In essence Florida rates "start" at a comparable level as they did prior to deregulation, while Arizona rates are based on a somewhat higher rate. As miles, shipment weight, and commodity class factors are "added in", the rate rises or falls. The Arizona rate, for example, rises .6657 cents less per mile than prior to deregulation. The net impact, therefore, of the change in the rate structure depends upon the number of miles, shipment weight, etc., associated with the movement. Therefore, universal statements such as "rates in Arizona have risen (fallen) X percent since deregulation" are meaningless. It is a mixed bag; some factors such as the intercept in Arizona have risen, others such as the rate per mile have fallen. The net impact must be judged on a movement by movement basis.

Fuel Cost and Unemployment Rate

In Arizona, fuel costs and rates were positively related prior to deregulation, as would be expected. Subsequent to deregulation, however, the fuel cost-freight rate relationship disappears. In Florida, no strong relationship is exhibited prior or subsequent to deregulation. (In the B models a small but statistically significant negative relationship is indicated). The unexpected performance of the parameters associated with fuel cost may be related to the small variations in this variable over much of the sample period.

The parameter estimates associated with the unemployment variable for Arizona also have the unexpected sign. Prior to deregulation an increase in unemployment is associated with an increase in rates. For the B models, the theoretically anticipated negative relationships are indicated. Moreover, subsequent to deregulation, the unemployment rate-freight rate relationship becomes insignificant in all Arizona models. In Florida, the anticipated negative relationship is evident in all models. As with fuel cost, no convincing explanation is immediately apparent for the unexpected parameter signs. The most plausible explanation is that there is some correlation with time. This is suggested by the sensitivity of the fuel cost and unemployment rate parameters to the use of annual binary variables (the A models) or a trend term (the B models). This collinearity problem is not considered to be serious in the current study, as the parameter estimates for these variables and for time are not of central interest.

SUMMARY AND CONCLUSIONS

This study has examined pre- and post-deregulation motor carrier rate data for 12 routes in Arizona and 20 routes in Florida. The routes were choosen to allow for variation with respect to the lengths of haul, areas of the states, and sizes of communities served. For each route, rates were collected from a variety of carriers and for various shipment weight and commodity classifications. The sample periods were January 1980 through October 1984 for Arizona, and January 1979 through October 1984 for Florida. This provided for 2 1/2 and 1 1/2 year pre-deregulation periods for the states, respectively. The shorter pre-deregulation period for Florida was felt to be sufficient, as deregulation occurred there largely without warning. By contrast, in Arizona up to two years before deregulation, the possibility of deregulation was evident. The total number of observations for the study were 49,967 for Arizona and 105,500 for Florida.

In this section, the results will be organized by discussing them in terms of the seven issues addressed in the study. These are the impact of deregulation on:

1. average rate levels,
2. rates per mile,
3. differences between rates based on cargo types,
4. differences between rates per unit weight for large and small shipments
5. differences between rates to urban and rural areas,
6. rate variability, and
7. carrier entry and exit

Average rate levels did not vary greatly along most routes between the pre-deregulation and the post-deregulation periods. In fact, over all Florida routes and half of the Arizona routes, average rates were lower in the post-deregulation period. Comparison with averages of corresponding interstate rates reveals that over all routes studied, interstate rates rose at a faster pace than did intrastate rates. This evidence strongly suggests that deregulation has had generally salutory effects on rate levels, at least from the perspective of shipper/receivers.

It should not be concluded from the above that deregulation has led to lower rates for all shipments. The results of the regression analysis indicate that deregulation has somewhat altered rate structures, particularly in Arizona. In that state, lower weight and rural shipments have benefited from deregulation relative to high weight, urban shipments. Moreover, the rate per mile has been reduced, but the intercept term has increased. Therefore, the net increase or decrease resulting from deregulation should be judged on a shipment-by-shipment basis. Nevertheless, it should be stressed again that most rates have had moderate increases or more often decreases since deregulation, and that all rates have increased less than the corresponding interstate rates.

Rates per Mile

The results of the regression analysis indicate that the pre-deregulation rate-distance gradient per hundredweight of freight was $1.93 per mile in Arizona and $1.00 in Florida. Subsequent to deregulation, the rate-distance gradient was reduced to around $1.26 per mile in Arizona and remained constant in Florida. The sharp reduction in Arizona suggests that distance-related economies resulted from deregulation. This result is particularly impressive considering that deregulation was coincident with a change in the tax structure in Arizona which should have increased the rate-distance gradient. It may be that with release from commodity and area restrictions, carriers are able to realize higher load factors.

It is not known why there was no similar reduction in the distance-rate gradient in Florida after deregulation. It may be that the commodity and area restrictions in Florida were not as constraining as in Arizona. Moreover, the pre-deregulation rate structure has a much lower rate-distance gradient than in Arizona. This regulated level may have already been near to that which would have resulted in an unregulated environment.

Differences Between Rates Based on Cargo Types

The analysis reveals that, in both states, rate differentials between cargos of different commodity classes have remained after deregulation. This results will be of surprise to those who have asserted that commodity class-based pricing is a form of value-of-service pricing which would collapse outside of a regulated environment. This result, however, is consistent with the empirical works of Blair, Kasserman, and McClave (1983), and Beilock (1985).

Recent theoretical work by DeVany and Saving, Salop and Wilde, and others have presented rationales for value-of-service pricing in the absence of regulation. While some of these theories rely on price discrimination due to imperfect information, some assert that value-of-service pricing may be simply the result of higher rates going to pay for increased services. Therefore, the observed preservation of commodity class-based rates in Arizona and Florida cannot be, in itself, viewed as an indicator of market failure. Moreover, even if this is viewed in an unfavorable light, it should be remembered that it is no more pronounced than under regulation.

Differences Between Rates Per Unit Weight for Large and Small Shipments

Contrary to some expectations, the results indicate that the premium paid per unit weight for small shipments has declined since deregulation. This result was consistent across the two states. The decline in rates per hundred pound increase in shipment size was reduced by 1.16 cents per hundredweight in Florida and 1.66 cents per hundredweight in Arizona. These changes are statistically significant at the .01 level.

Differences Between Rates to Urban and Rural Areas

Three different proxies were employed to measure remoteness: proportion of the route off a U.S. Interstate or the Florida Turnpike; distance of the smallest endpoint community from a U.S. interstate or the Florida Turnpike; and a binary variable to designate some routes as urban-rural. Regardless of the specification employed, the results were consistent. In Arizona, the premium paid prior to deregulation for service to remote areas has largely disappeared. In Florida no premiums or penalties were paid before or have been apparent since deregulation.

Rate Variability

Both in terms of frequency and size of rate changes, variability has been lower in Arizona since deregulation. This is true in absolute terms and in comparison with corresponding interstate rates. In Florida, the average size of rate changes has lowered since deregulation. However, the frequency of changes has increased somewhat. It should be pointed out that in a deregulated environment special rates may be negotiated anytime. What has been measured in this report is the rate variability of commonly used, published rates. As these rates have not exhibited unusual variation, it appears clear that rate variability has not manifested itself as a post-deregulation problem.

Carrier Entry and Exit

Carrier entry and exit were only tangentially examined in the study. No rigorous comparisons can be made regarding pre- and post-deregulation carrier entry and exit frequency. However, it is evident from the study that shipper/receivers have access to a variety of carriers along all types of routes. For all routes studied, as many or more carriers were found subsequent to deregulation as were found before.

Conclusion

In Arizona and Florida, deregulation has resulted in surprisingly moderate changes in motor carrier freight rates. In both states, rates have not become unstable, and therefore, are not difficult for users to determine. Moreover, the system of commodity class-based rates has been maintained.

Some changes have occurred, particularly in Arizona. In both states rates are generally lower than would have been the case if regulation were still in force. Also, small shipments are not penalized relative to large shipments as much as prior to deregulation. In Arizona rates per mile have lowered, and the penalty levied for serving remote locations has largely disappeared. In Florida no changes in these regards were noted. However, it should be mentioned that rates per mile in Florida are lower than in Arizona and that no penalty related to serving remote areas was evident.

We are drawn, finally, to the salient question: "has deregulation been beneficial in Arizona and Florida?" With some qualifications, our answer is yes. The direct costs of regulating these trucking markets have been eliminated and chaos has not resulted. To the contrary, rates are stable and moderate. Moreover, no group of shipper/receivers has been disenfranchised by being forced to pay extraordinary rates. This, coupled with the results of earlier studies which indicate that service levels have been maintained or improved, leads to the conclusion that from the point of view of the shipper/receiver deregulation has been a good thing.

It is more difficult, however, to speak from the carrier's point of view. With moderated rate levels and open competition, carriers lead a less sheltered life than before deregulation. Some, no doubt, have experienced reductions in profit levels. Others, however, are now free to compete in markets they were previously excluded from. Moreover, there is evidence that deregulation has resulted in increased efficiency. For example, the reduced rate-distance gradient in Arizona is suggestive of higher load factors. These new efficiencies may permit reduced rates with constant or improved profits. Clearly the vote for or against deregulation depends upon which carrier is asked. None however, would be likely to assert that their worse fears regarding deregulation have been realized. The intrastate motor carrier systems in Arizona and Florida have survived deregulation, and survived well.

FOOTNOTES

1. Examples of these studies include Harper, ICC (1981a), Beilock and Freeman (1983), and ICC (1981b).

2. In the capture theory it is asserted that the regulated come to control regulators, bending their [the regulator's] policies to the benefit of the regulated rather than to the benefit of society. The rationales behind this include:

    1. Regulators are often former members of the regulated industry. They, therefore, may be sympathehetic to the needs of the regulated;
    2. The regulated frequently would have contact with their regulator, further opening the door to possible influence;
    3. The regulated usually have a large and evident stake in regulatory policies relative to the society as a whole. Therefore they [the regulated] have the best incentives to organize and provide funds for the purpose of influencing regulators.

3. For example, see Miller, Beilock and Kilmer, and Jara-Diaz.

4. To show the relationships between the elasticity of demand for transportation and the elasticities of supply and demand for the commodity, begin by assuming linear demand and supply functions:

$$(1) \quad Q_D = a - b\,P_Q$$

$$(2) \quad Q_S = c + d\,P_{FOB}$$

$$(3) \quad Q_S = Q_D = Q$$

where: Q_D, Q_S = quantities demanded and supplied, respectively

P_Q, P_{FOB} = demand and supply prices (net of transportation costs, P_T)

a,b,c,d = positive parameters

Taking the inverse of (1) and (2) and using (3):

$$(4) \quad P_q = \frac{1}{b}\,(a-Q), \text{ and}$$

$$(5) \quad P_{FOB} = \frac{1}{d}\,(-c+Q).$$

Define P_T, the transportation prices as:

$$(6) \quad P_T = P_Q - P_{FOB}$$

$$(6a) \quad P_T = \frac{1}{b}\,(a-Q) - \frac{1}{d}\,(-c+Q)$$

$$(6b) \quad P_T = (\frac{a}{b} + \frac{c}{d}) - Q(\frac{1}{b} + \frac{1}{d}).$$

Solving for Q yields

$$(7) \quad Q = \frac{1}{(\frac{1}{b} + \frac{1}{d})}\,(\frac{a}{b} + \frac{c}{d}) - P_T$$

The elasticity of demand for transportation (E_T) is:

$$(8) \quad E_T = \frac{1}{(\frac{1}{b} + \frac{1}{d})}\,\frac{P_T}{Q}$$

From (1) and (2) and using (3) we may derive the following:

$$(9) \quad b = -\frac{E_D Q}{P_Q}, \text{ and}$$

$$(10)\quad d = \frac{E_S Q}{P_{FOB}}$$

where

E_D = elasticity of demand for the commodity.
E_S = elasticity of supply for the commodity

Substituting (9) and (10) into (8) yields

$$(11)\quad E_T = \left(\frac{E_D E_S}{P_Q E_S - P_{FOB} E_D}\right) \frac{P_T}{P_Q}$$

Recalling that $P_{FOB} = P_Q - P_T$, (11) may be rewritten as:

$$(12)\quad E_T = \left(\frac{E_D E_S}{E_S - (1 - \frac{P_T}{P_Q})\, E_D}\right) \frac{P_T}{P_Q}$$

or

$$(12a)\quad E_T = \left(\frac{E_S}{E_S - (1 - \frac{P_T}{P_Q})\, E_D}\right) E_D \frac{P_T}{P_Q}$$

$$(12b)\quad E_T = R\, E_D \frac{P_T}{P_Q},\ \text{where } R = \frac{E_S}{E_S - (1 - \frac{P_T}{P_Q})\, E_D}$$

Notice that as long as $E_D < 0$, the R will be positive and less than 1. Moreover, it approaches unity as $E_s \to \infty$. Therefore, the parenthetical expression scales down E_t (in absolute terms) as E_S deviates from infinity.

5. Commodity classifications are determined by several criteria, including commodity value.

6. Corresponding interstate rates exist for instances in which a carrier hauls a cargo over a portion of an interstate movement which is entirely within one state.

7. For a further explanation of estimation with pooled cross-sectional and time series data see Kmenta, pp. 508-17.

8. In Appendix 5, regressions by route are presented.

9. Particular thanks are due to Mr. Steven Orcutt of the Phoenix Traffic Service and Mr. Willaim Baird of Downey and Company.

APPENDIX 1

REGULATORY BACKGROUND

REGULATORY BACKGROUND

Florida

During the 1980 legislative session, general dissatisfaction with the Florida Public Service Commission (FPSC) was voiced by diverse interests throughout the state. Some legislators and bureaucrats believed the FPSC to be overly protective of the motor carrier industry with respect to entry and rates. Furthermore, these people evinced a philosophy of minimizing government intervention in and distortion of free market principles and competitive forces. Many trucking industry executives believed, however, that the FPSC had become punitive in its enforcement of safety regulations and that the Commission was not offering adequate entry protection to existing carriers. In fact, during the last months prior to deregulation, the FPSC seemed to be approaching "fitness only" entry requirements, a major reversal of its previous strict policy concerning increased intrastate competition.

Rate issues were of great concern to many trucking executives, who believed that the FPSC's rate adjustment policy was unreasonably burdensome, onerously enforced. and unsympathic toward independent action or innovative new tariffs. Carriers contended that intrastate rates averaged 10-20 percent below equivalent interstate rates and that the rate bureau mechanism endorsed by the FPSC was an unrealistic system for meeting the trucker's needs. Under existing procedures, the vast majority of applicable freight moved under the tariff levels established by the Florida Intrastate Rate Bureau. General increases to the normal mileage and class rates were made across the board and approved or rejected in part or in toto by the FPSC on the basis of selected test year financial data from a sample of carriers chosen to reflect all geographical areas of the state and perhaps 80 percent of all tonnage and revenues. While carriers had the right of independent actions, the FPSC displayed an unusual and surprising interest in minmizing such actions. Up until the last six months of regulation, conformity of rates was a very strong FPSC policy, with much emphasis being placed on assuring that independent rate proposals did not cause discrimination and were "fair and nonpreferential."

Perhaps the most severe impediment to independent action, especially action to attract new business from a small or select group of shippers or commodities, was the FPSC's requirement that many individual rate proposals be cost justified, in the same manner as an across-the-board general rate increase affecting the entire state. The impossibility of cost justifying a simple rate decrease or increase proposed by a single carrier for a particular commodity, as well as the expense involved in gathering financial data and test year studies, made independent action all but prohibitive. Even if there were no protests or requests for suspension of the rate, the FPSC would itself move for a suspension, thus triggering the elaborate cost justification procedures. The effect was simply to overwhelm any carriers attempting to break out of the existing rate bureau mold.

Because of this general dissatisfaction from all sides with the scope and quality of regulation being exercised by the FPSC, numerous proposals which would dramatically change motor carrier regulation were circulated around Florida's House of Representatives and Senate. Some attempts were made to effectively end entry controls while retaining rate regulation. Carriers challenged these efforts by asserting that it would be unfair to change the delicate and subtle trade-ofts that exist in motor carrier law.

Without effective entry controls, they argued, continued rate regulation and enforcement of the common carrier obligation would be punitive and unreasonable. Proposals by the motor carrier industry were equally unappealing to other proponents of revamping the FPSC. Finally, as the deadline for action approached, the House and Senate passed different FPSC reform bills and were unable to agree on any compromise. Thus, last minute efforts to continue motor carrier regulation in a revised form were unsuccessful; and on July 1, 1980, Florida's motor carrier industry awoke to a sunset surprise. Pursuant to Florida's sunset review process, the statutes granting the FPSC authority to regulate intrastate motor carrier operations expired. For the first time since 1929, the State of Florida was no longer regulating the trucking industry.

As virtually no one had expected FPSC authority to be abolished on June 30, 1980, the trucking industry had no time to plan for total deregulation and had to react immediately to its new found freedom. As Florida was the first state to free its truckers from regulation, no one knew what would happen, and a certain sense of caution or timidity prevailed over much of the industry. This feeling was heightened, perhaps, by the lack of a transition period from regulation to deregulation, during which the motor carriers could assess their overall strengths and weaknesses and develop marketing strategies that would optimize their operations. There was no time to evaluate possible changes, to discuss rate reductions or increases, or to analyze innovative tariff possibilities. While some carriers immediately responded to deregulation, most carriers seemed to adopt a wait-and-see attitude. They continued operating as usual, under existing tariff rates, and reacted to changes brought about by other carriers, both new and old, on an ad hoc basis.

In addition to the uncertainty and lack of planning time caused by the abrupt total deregulation, another factor mitigating against sudden change was the law suit filed by several large intrastate carriers in an effort to overturn the deregulation. Many carriers stated that they did not want to revamp operations dramatically so long as the possibility existed that regulation would be reintroduced. Thus, these carriers opted to maintain status quo operations, policies, and rates.

Existing freight patterns also have played an important role in deregulation strategy. Florida has a clear imbalance of north-south freight, with substantially more freight flowing south than returning north. Furthermore, the peninsula of Florida is rather narrow, thus contributing to the opportunity for carriers to attempt to cut down on northbound deadhead runs by soliciting northbound freight at almost any location in central and southern Florida. A major fear of Florida intrastate carriers was that the large interstate carriers, with terminal and market operations in place, would offer extremely low rates on truckload shipments or other large quantities of freight destined from southern Florida points to northern Florida points in order to minimize their deadhead movements. Because of the perceived economic power of these interstate carriers, some small intrastate carriers simply waited to see what freight would be of interest to these larger carriers rather than immediately adopting new marketing plans.

Approximately five years have now elapsed since Florida deregulated. Enough time has elasped so that most of the transportation industry has reacted to its new freedom. Most of the effects of deregulation, both good and bad, are being felt by now; and enough evidence is available so that some trends can be discerned. Thus, it seems to be a very desirable time to analyze the effects to date of deregulation on carriers and shippers in Florida.

Arizona

Arizona's motor carriage industry since the 1930's operated under a system of regulated monopoly. The foundations of Arizona's regulated monopoly system were laid in the State Constitution of 1912, which granted jurisdiction over common carriers to the Corporation Commission. In 1933, the Arizona legislature made three key modifications to existing law. First, the Corporation Commission was directed to prevent unnecessary duplication of service. Second, the law required that existing carriers be notified of any application for service in "their" area. Third, existing carriers were granted the right to match new service proposals, thereby precluding the awarding of the required certificate of public convenience and necessity to potential competitors. Virginia continues to operate under a similar system and appears to be the only remaining state with this type of intrastate trucking regulation.

The first indication that deregulation would become a significant transportation issue in Arizona came in the Fall of 1977 with the simultaneous announcements of the attorney General (now Governor) Bruce Babbitt and Corporation Commission Chairman Bud Tims that they recommended the easing of controls on the intrastate motor carrier industry. Both cited the existing regulated monopoly system as an obstacle to the efficient utilization of the State's transportation facilities and to the satisfaction of consumer needs.

Upon assuming the Governorship in 1978, Governor Babbitt proposed a fairly traditional regulatory reform measure easing entry and reducing ratemaking controls. The initial favorable response to the Governor's proposal by the Legislature had a dramatic impact on the stategies of the contending forces. Opponents of the proposed regulatory reform legislation, realizing that adamant and unequivocal opposition was doomed to defeat, shifted to a position that anything less than total deregulation was unacceptable. This flip-flop by the trucking industry appears to have occurred in several states. For example, once it became clear that traditional regulation would not be extended unaltered, truckers in Wisconsin also began pushing for less regulation. The impetus for such actions is the belief that attempts to alter traditional regulation would likely tamper with the benefits carriers derive from regulation, leaving costs associated with regulation unscathed.

In January 1979, a regulatory reform measure easing entry and reducing ratemaking controls was introduced to the Legislature. During the session, this bill, S.B. 1176, was rewritten to mandate the complete economic deregulation of intrastate motor carriage on July 1, 1982. S.B. 1176 was conditionally enacted "if and only if the Constitution of Arizona is amended by vote of the people at the next regular election, or at a special election called for that purpose, to remove the power of the Corporation Commission to regulate motor carriers." The ratification by a two-to-one majority of Proposition 101 in the November 1980 general election resulted in a constitutional amendment removing motor carriers from the definition of public service corporations. Thus, after July 1, 1982, the Arizona Corporation Commission was no longer empowered to regulate motor carriage.

APPENDIX 2

MINIMUM AND MAXIMUM INTRASTATE AND CORRESPONDING INTERSTATE RATES PER HUNDREDWEIGHT BY ROUTE

ARIZONA

JANUARY 1980 - OCTOBER 1984

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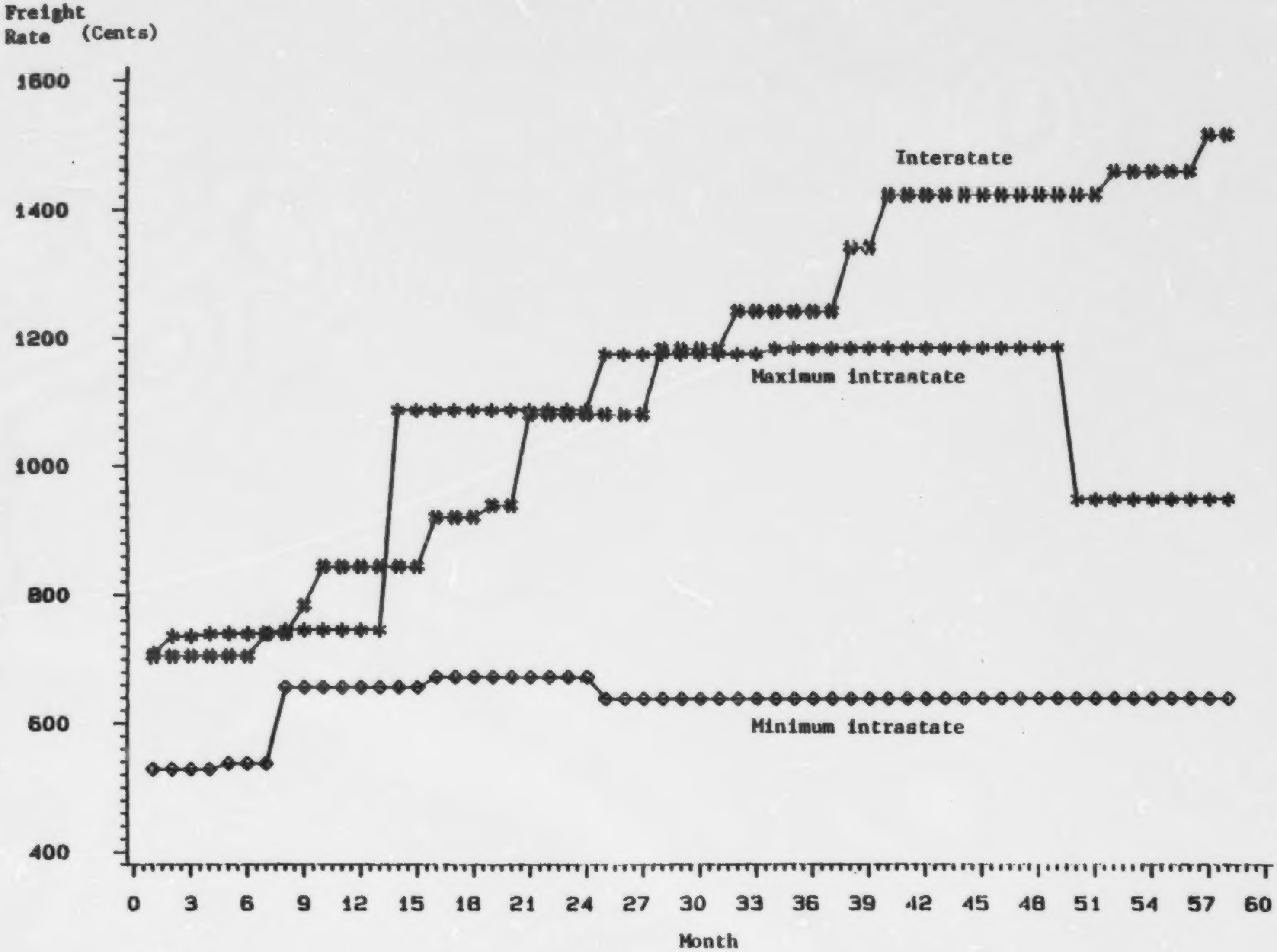

Figure 2.1 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 1,000 pounds, Arizona Route 1, January 1980-October 1984.

NOTE: Month 1 = January 1980.

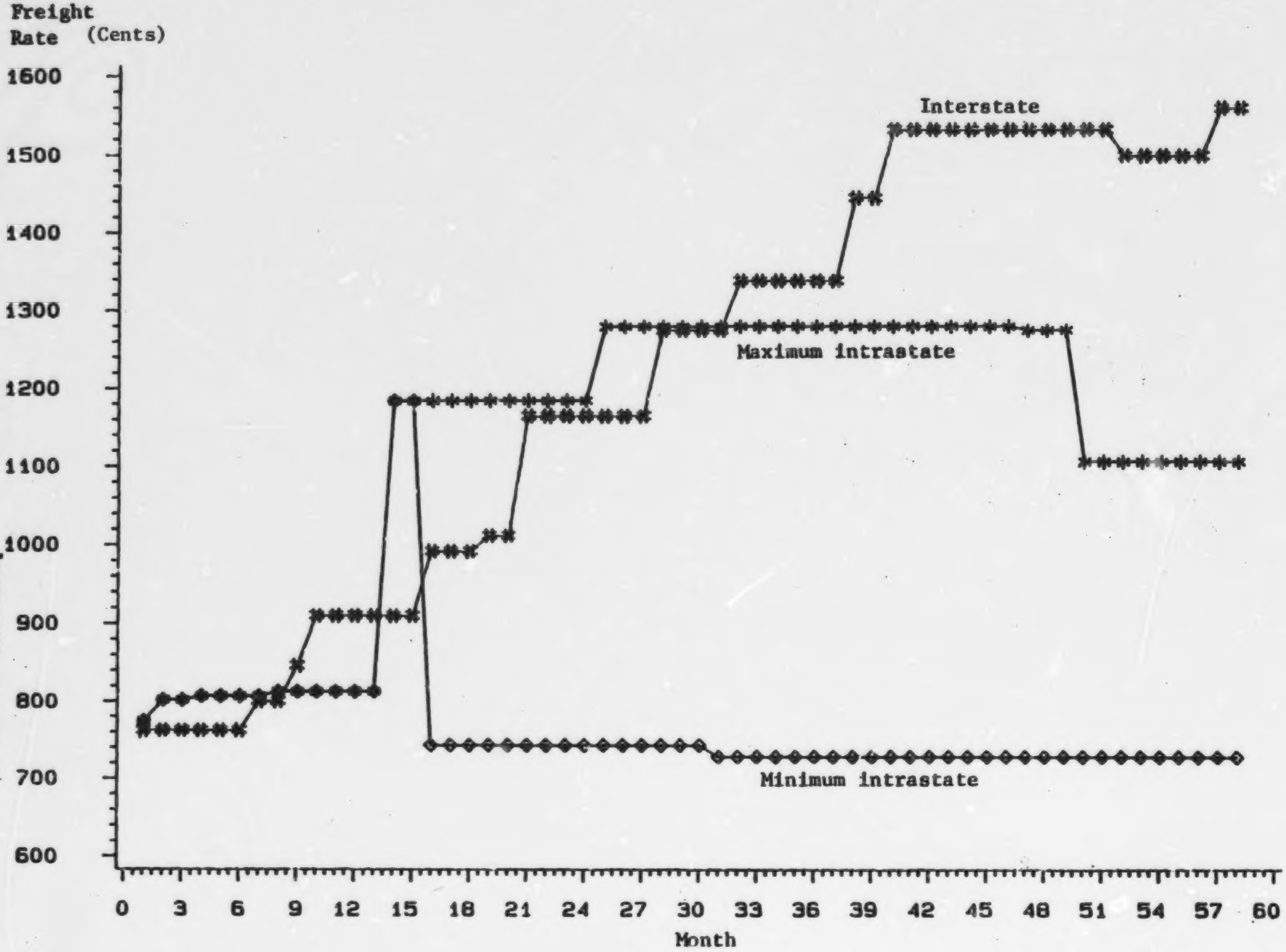

Figure 2.2 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 1,000 pounds, Arizona Route 2, January 1980-October 1984.

NOTE: Month 1 = January 1980. 86

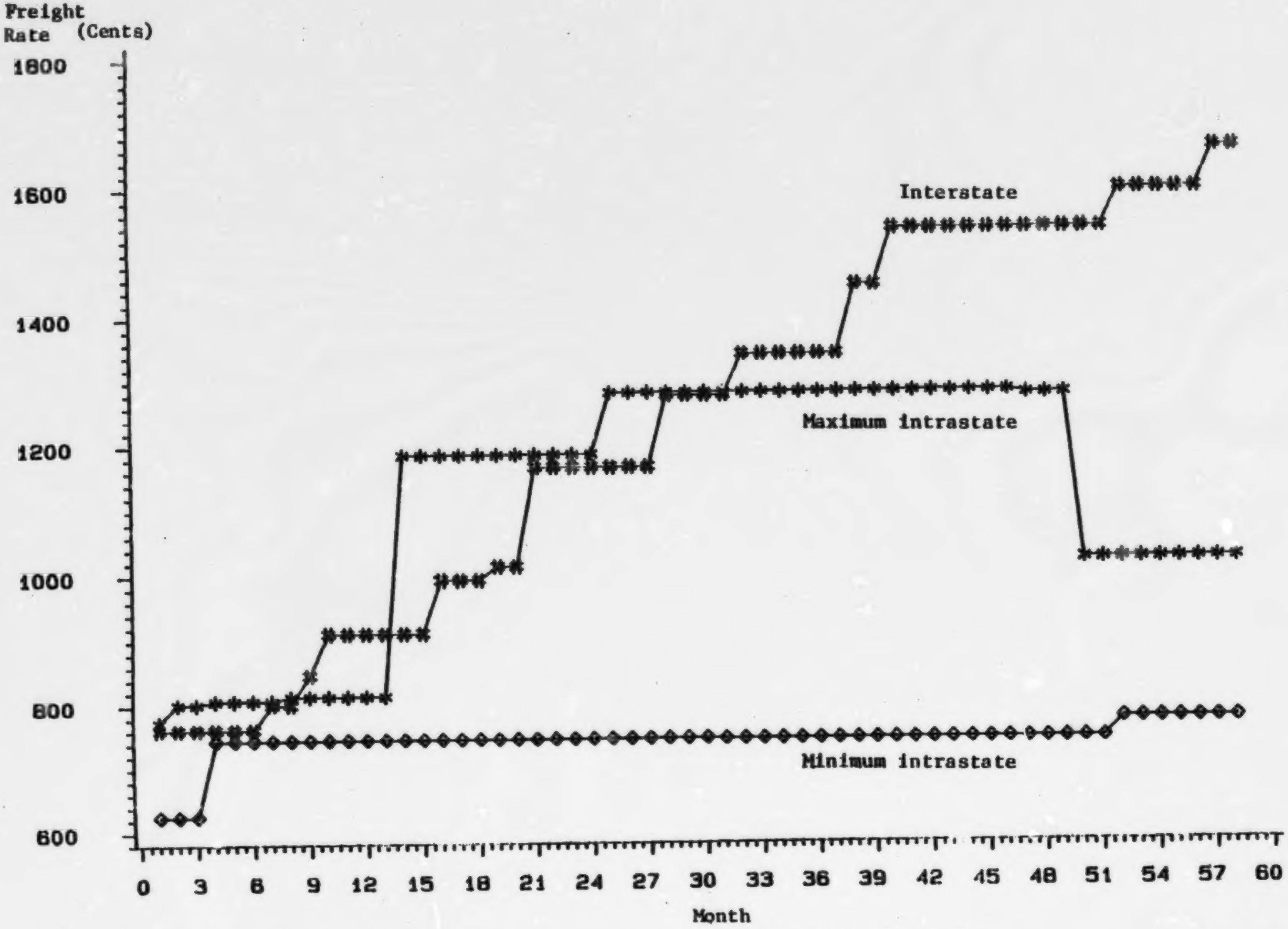

Figure 2.3 Minimum and maximum intrastate rates per hundredweight and correspnding interstate rate for shipment weight class under 1,000 pounds, Arizona Route 3, January 1980–October 1984.

NOTE: Month 1 = January 1980.

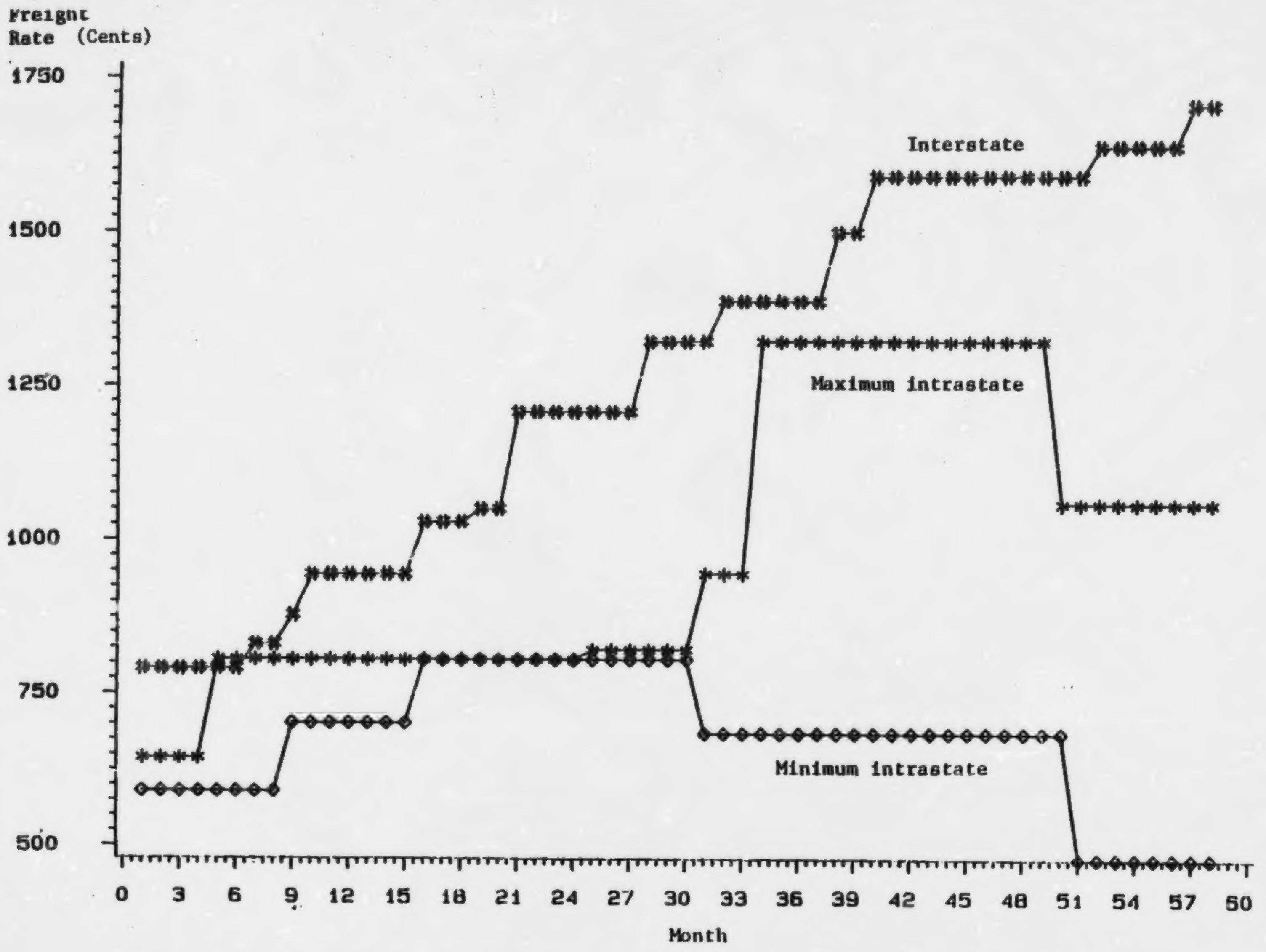

Figure 2.4 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 1,000 pounds, Arizona Route 4, January 1980-October 1984.

NOTE: Month 1 = January 1984.

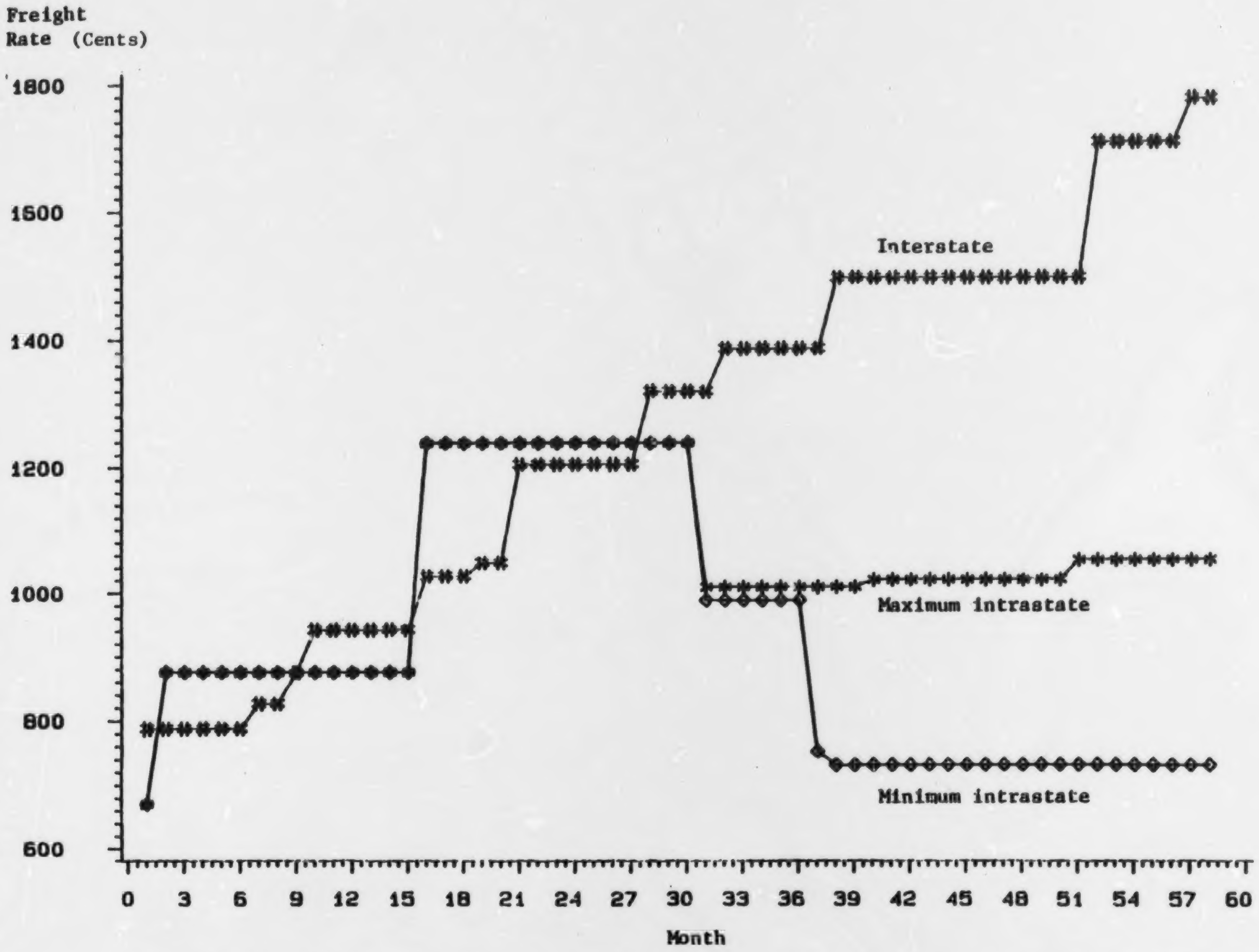

Figure 2.5 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 1,000 pounds, Arizona Route 5, January 1980-October 1984.

NOTE: Month 1 = January 1980.

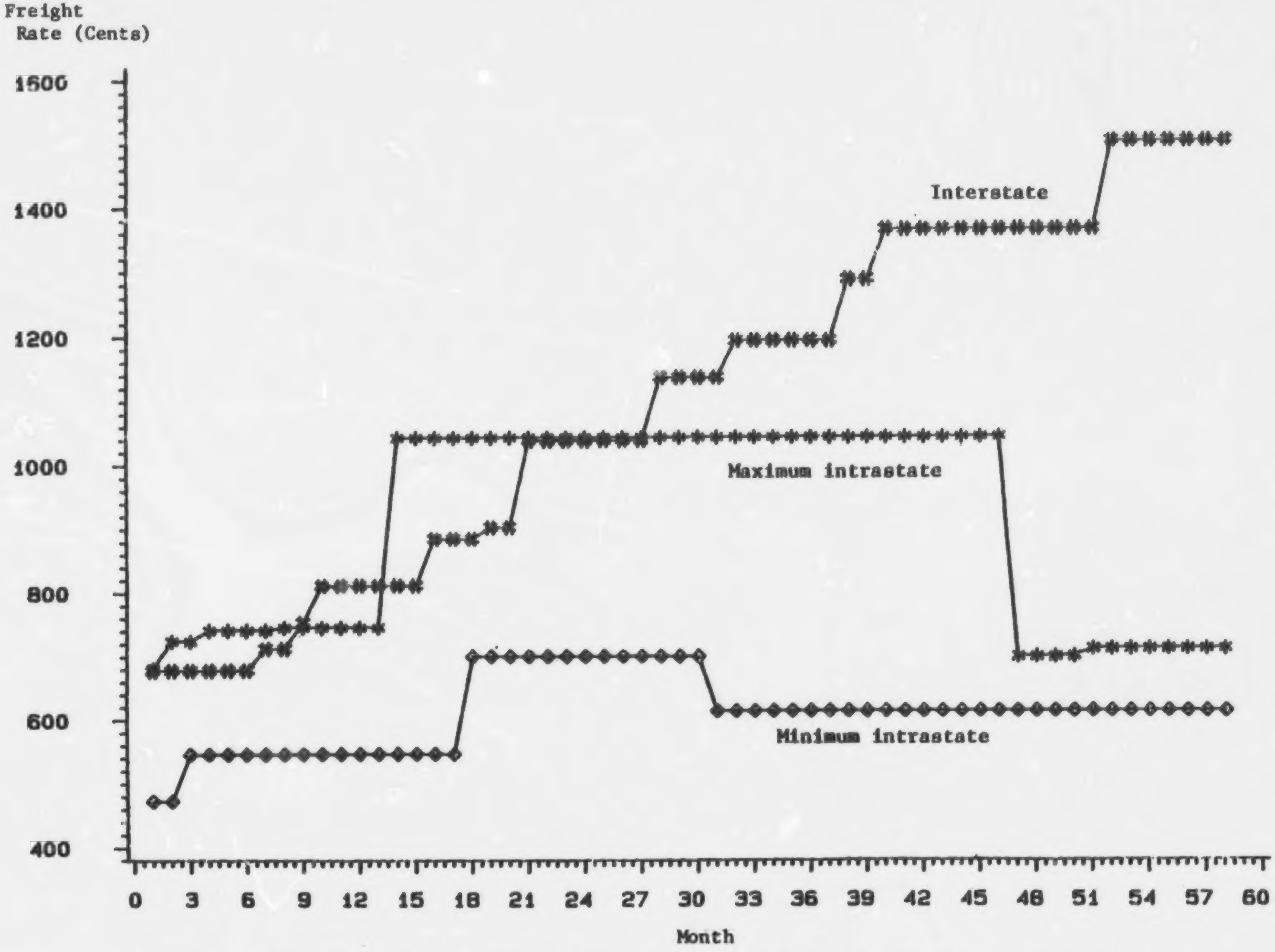

Figure 2.6 Minimum and maximum intrastate rates per hundredweight and corresponding interestate rate for shipment weight class under 1,000 pounds, Arizona Route 6, January 1980-October 1984.

NOTE: Month 1 = January 1980.

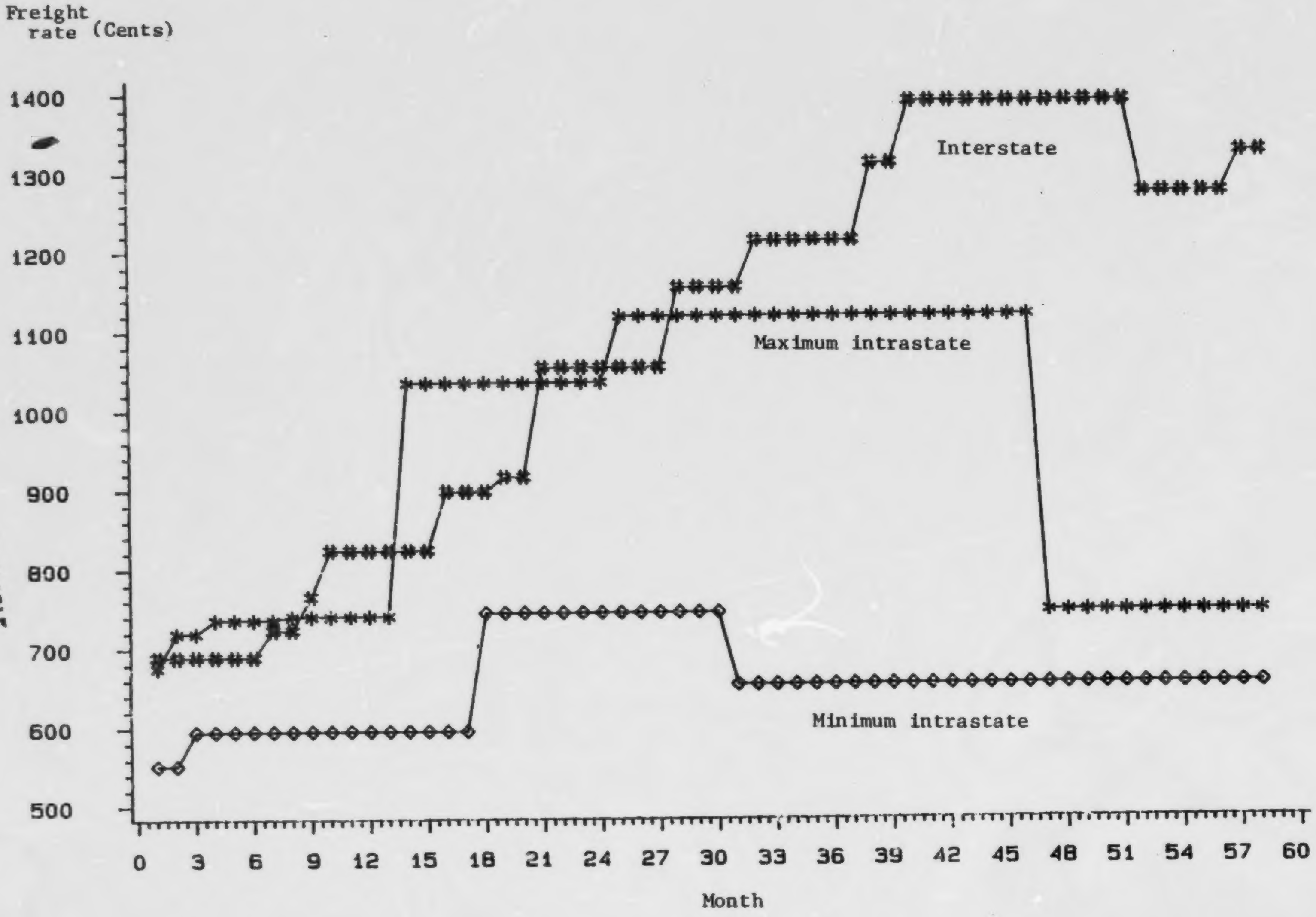

Figure 2.7 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 1,000 pounds, Arizona Route 7, January 1980-October 1984.

NOTE: Month 1 = January 1980.

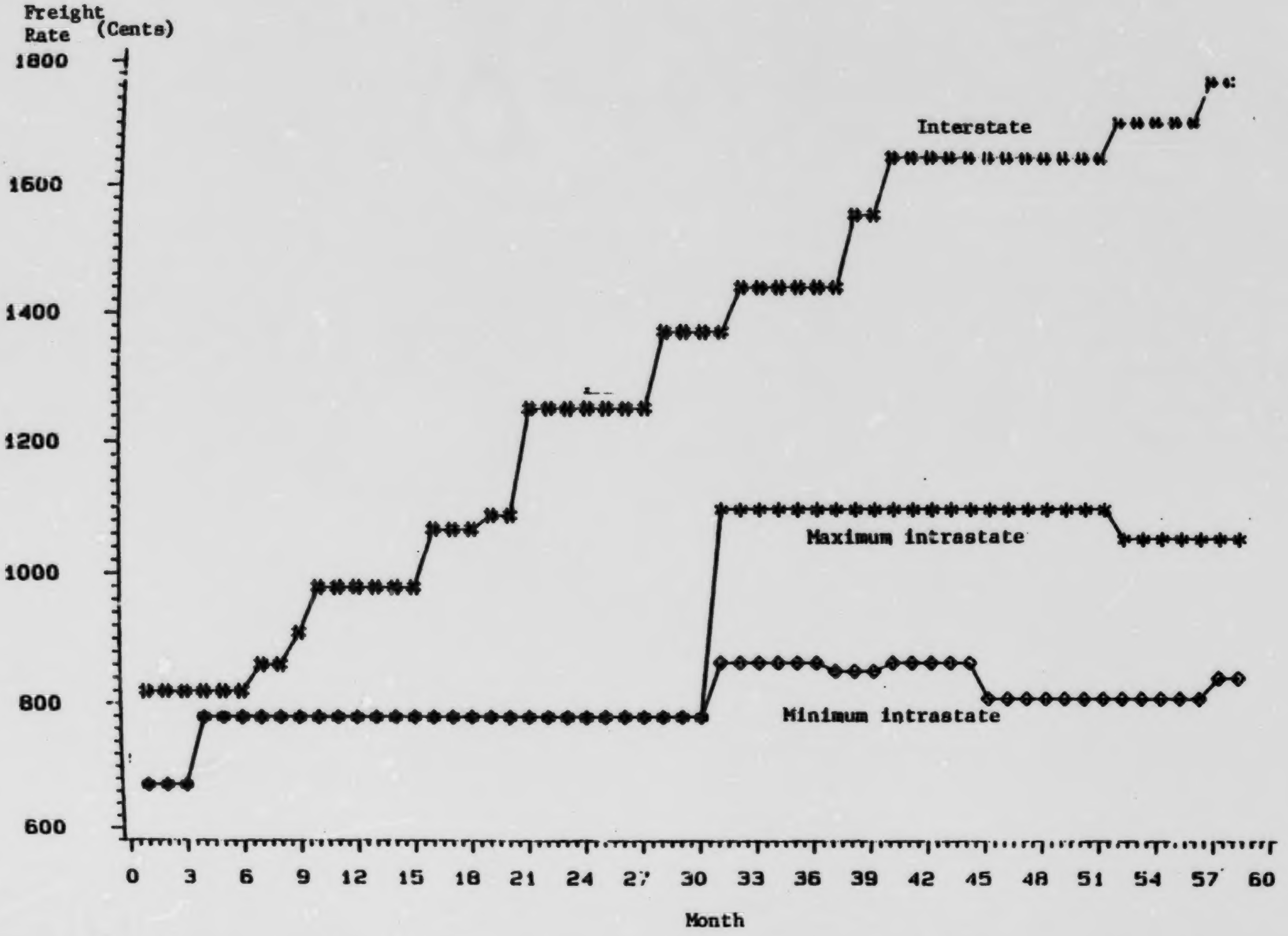

Figure 2.8 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 1,000 pounds, Arizona Route 8, January 1980-October 1984.

NOTE: Month 1 = January 1980.

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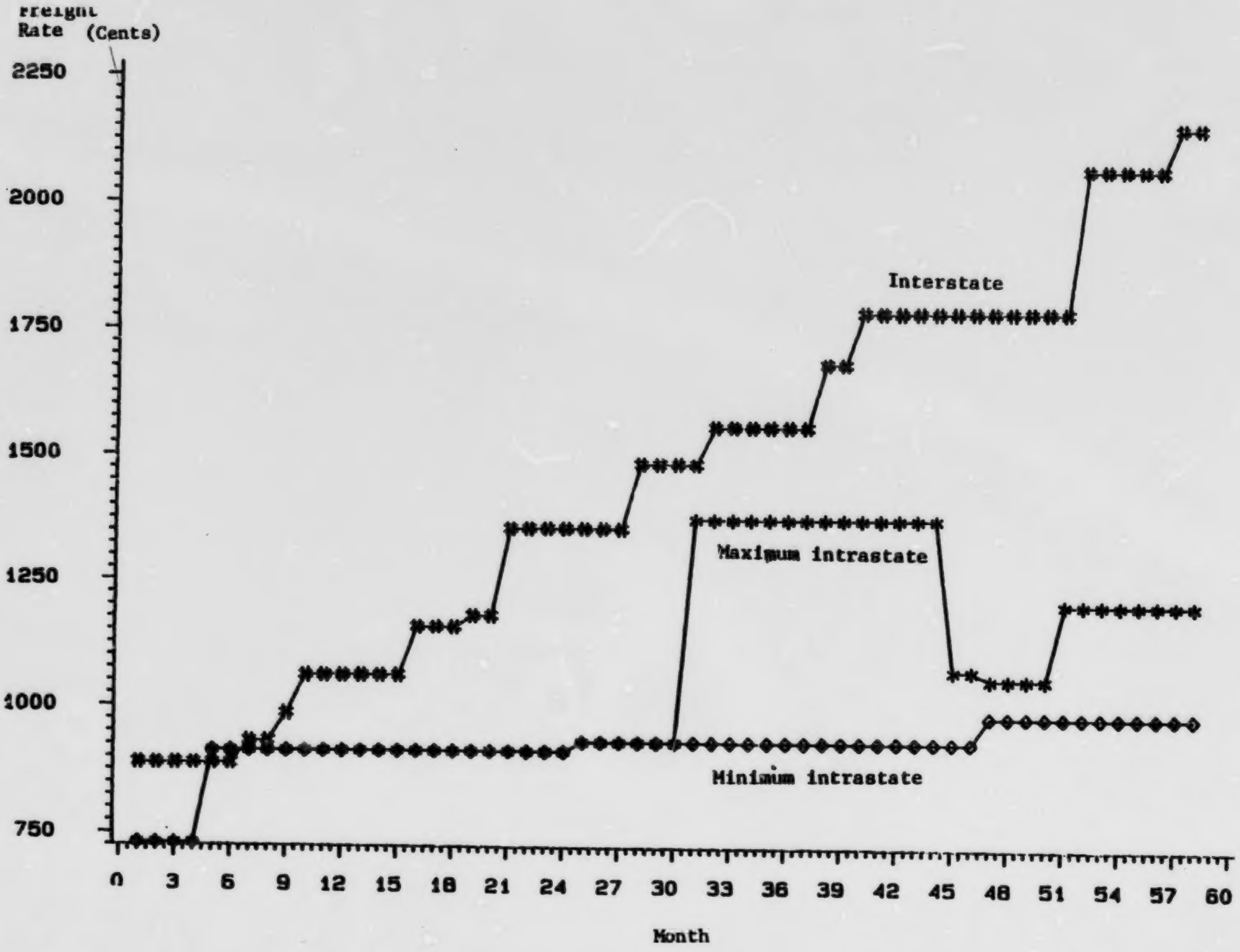

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Figure 2.9 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 1,000 pounds, Arizona Route 9, January 1980–October 1984.

NOTE: Month 1 = January 1980.

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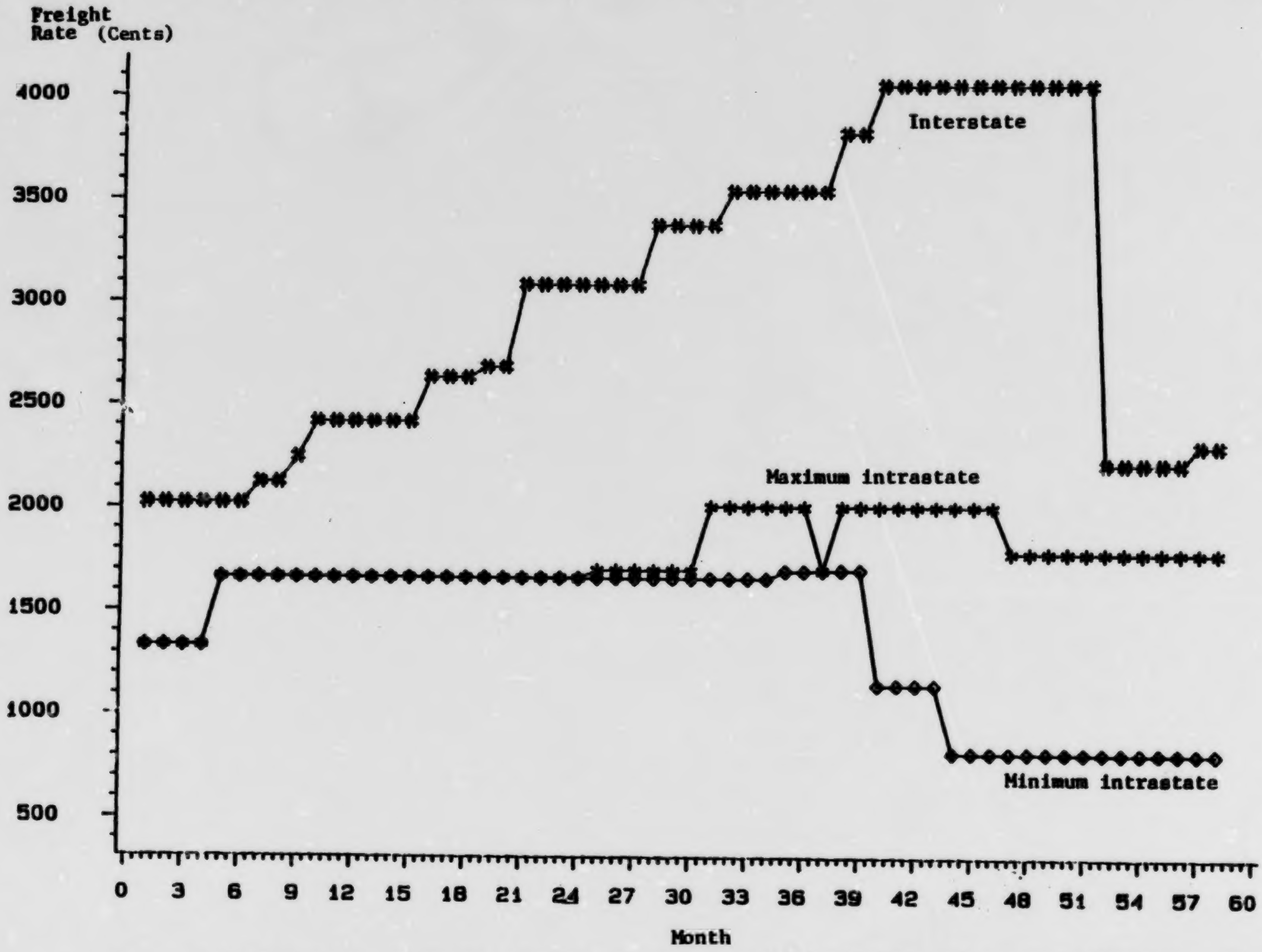

Figure 2.10 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 1,000 pounds, Arizona Route 10, January 1980-October 1984.

NOTE: Month 1 = January 1980.

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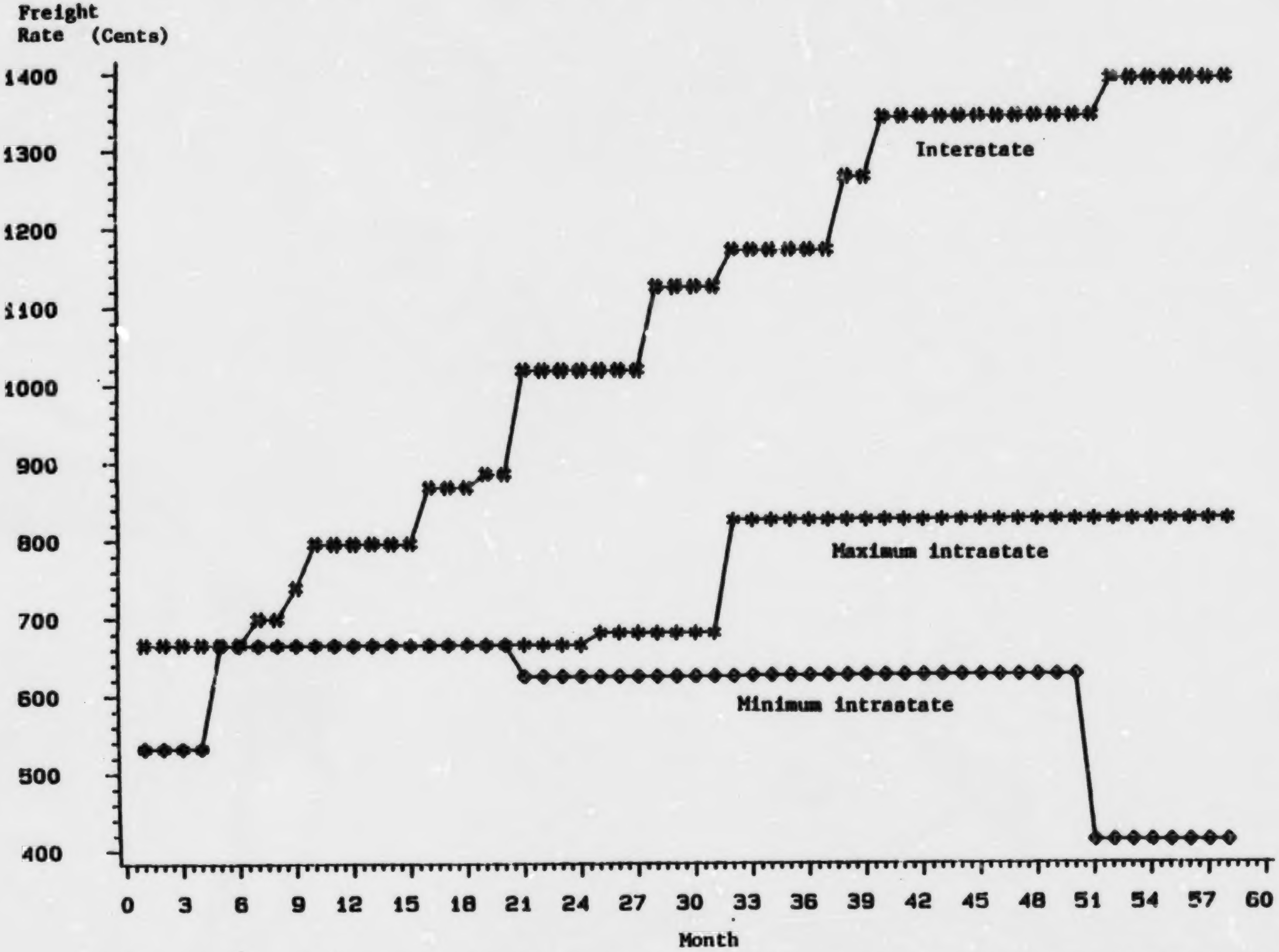

Figure 2.11 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 1,000 pounds, Arizona Route 11, January 1980-October 1984.

NOTE: Month 1 = January 1980

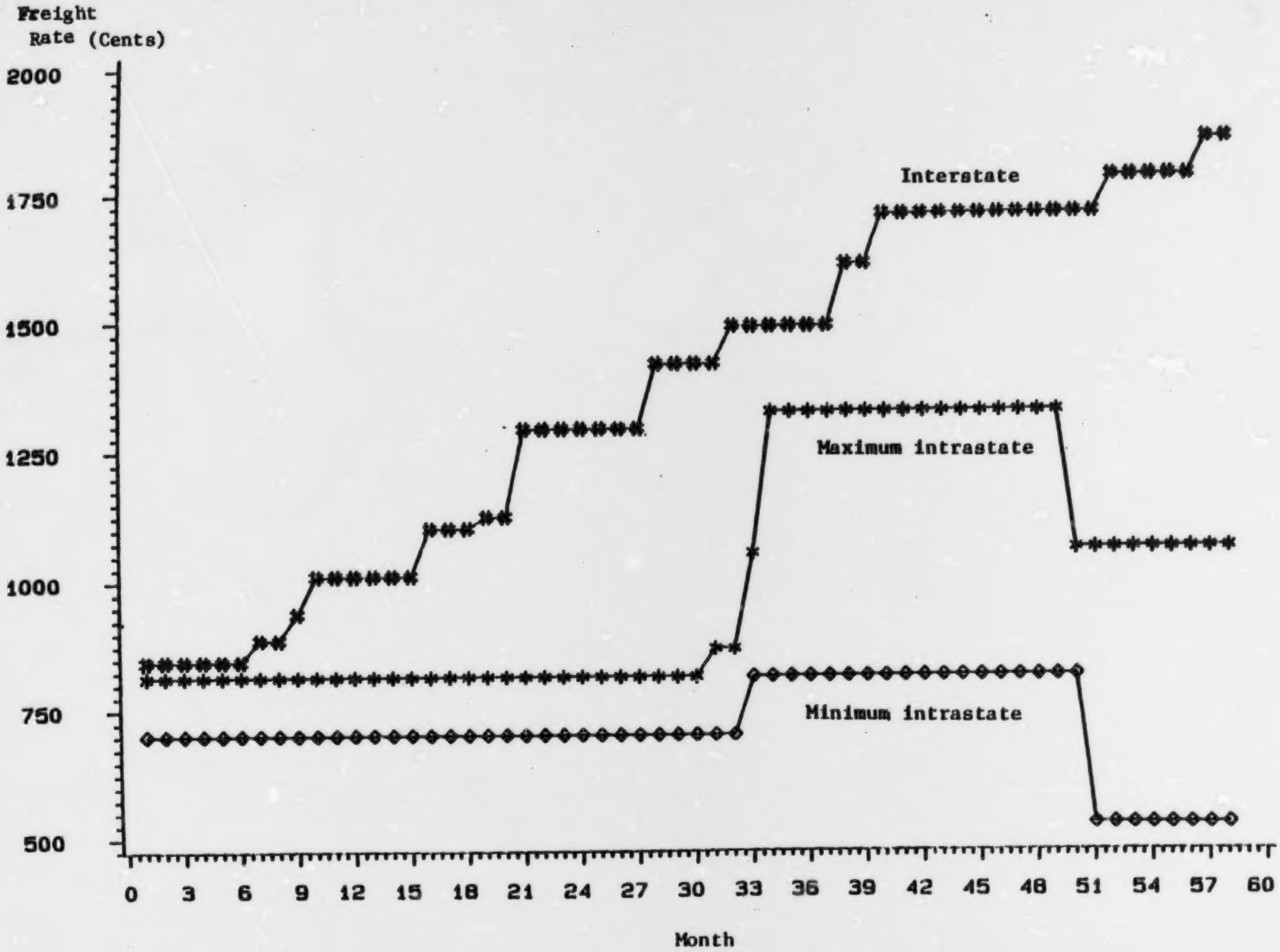

Figure 2.12 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 1,000 pounds, Arizona Route 12, January 1980-October 1984.

NOTE: Month 1 = January 1980.

FLORIDA

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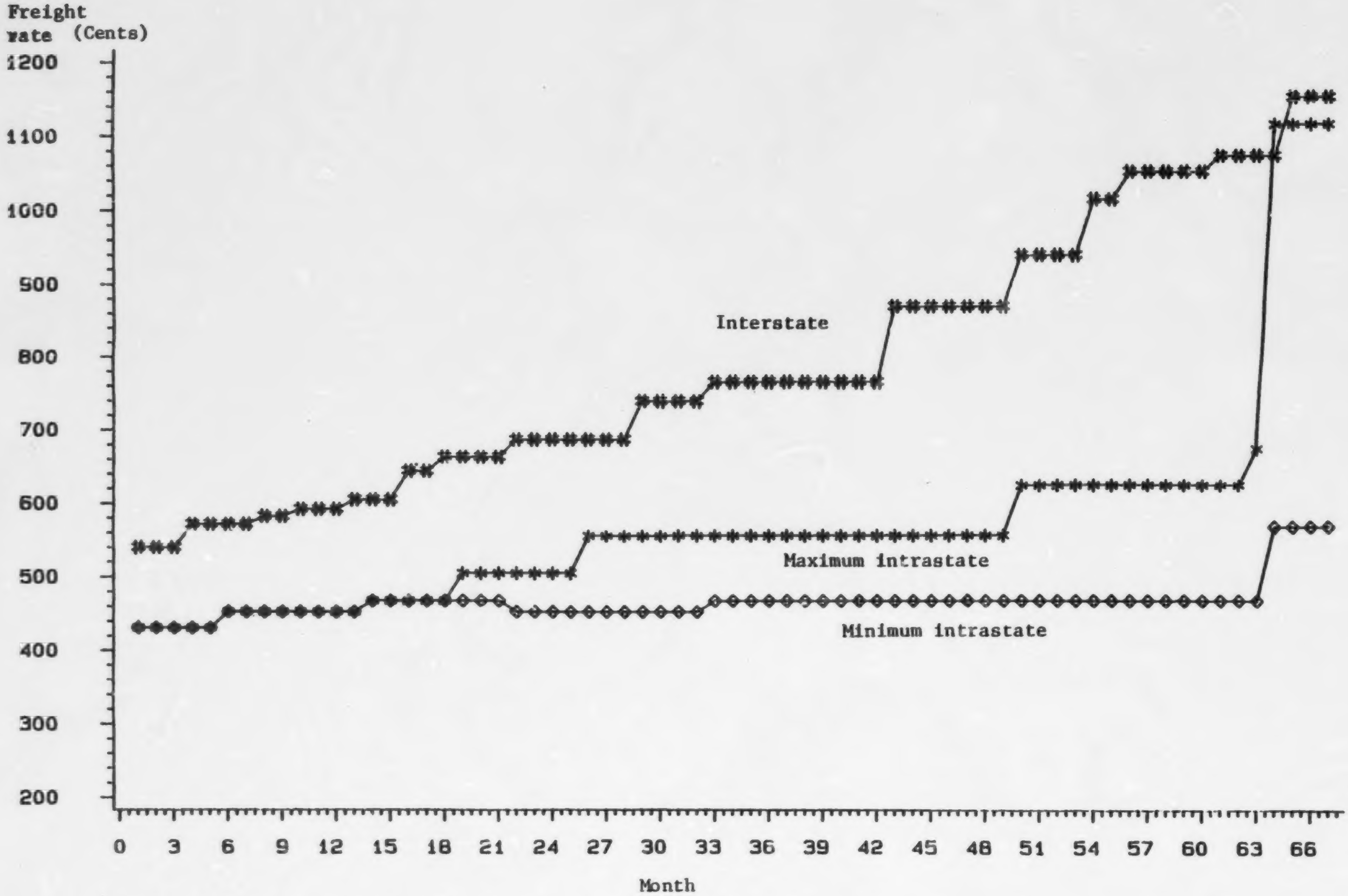

Figure 2.13 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 1, January 1979-October 1984.

NOTE: Month 1: January 1979.

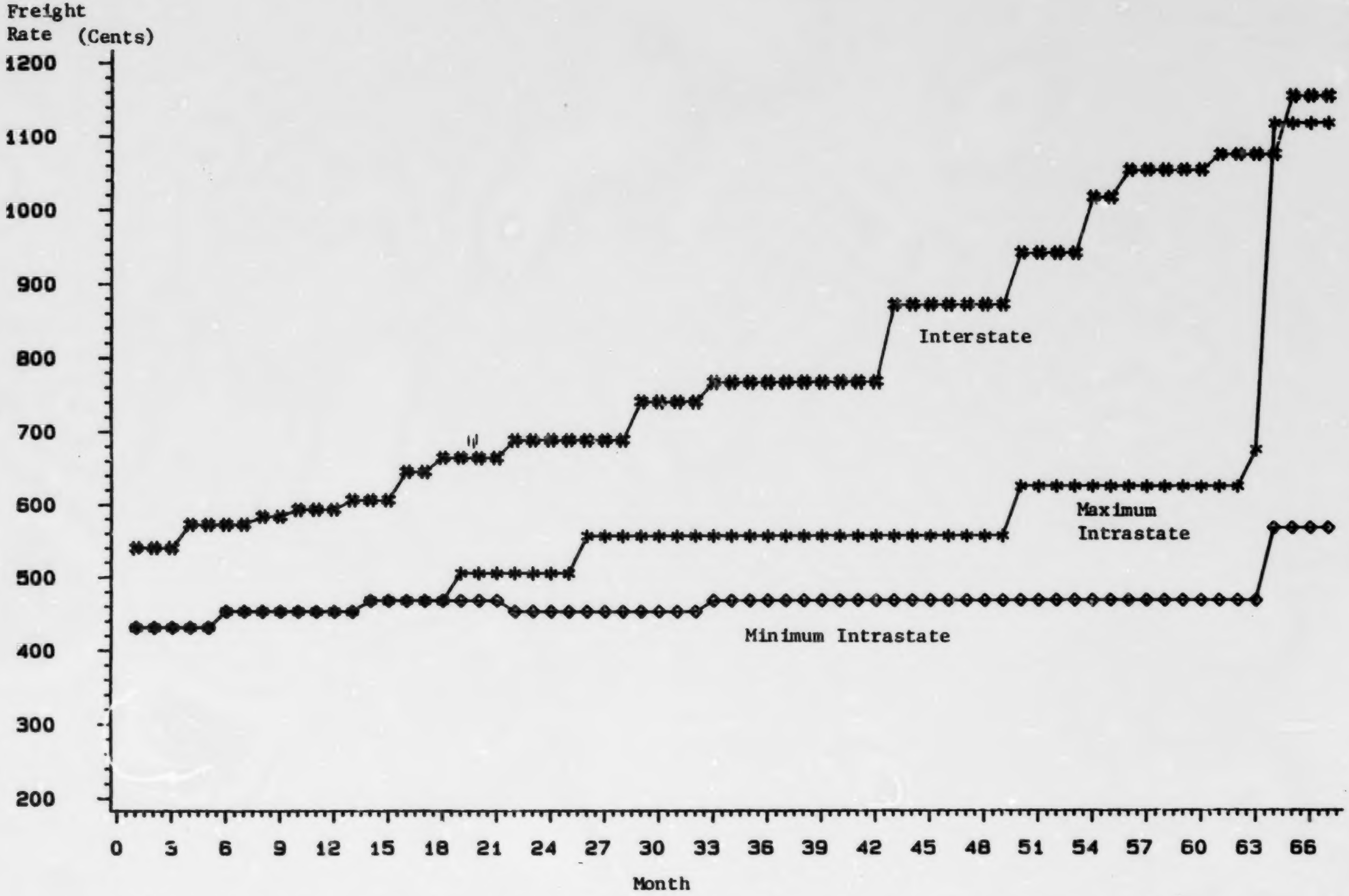

Figure 2.14 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 2, January 1979-October 1984.

NOTE: Month 1 = January 1979

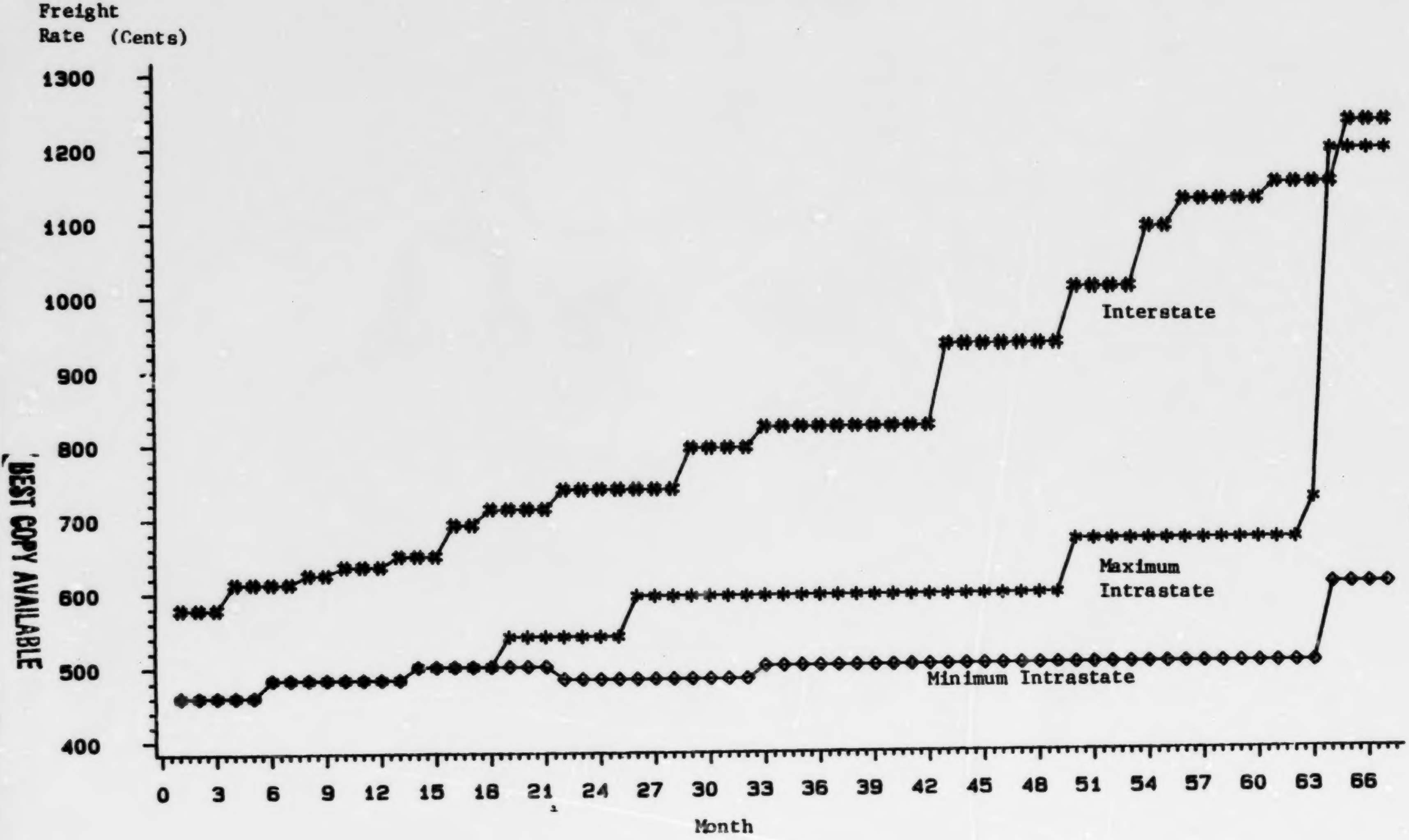

Figure 2.15 Minimum and Maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 3, January 1979-October 1984.

NOTE: Month 1 = January 1969

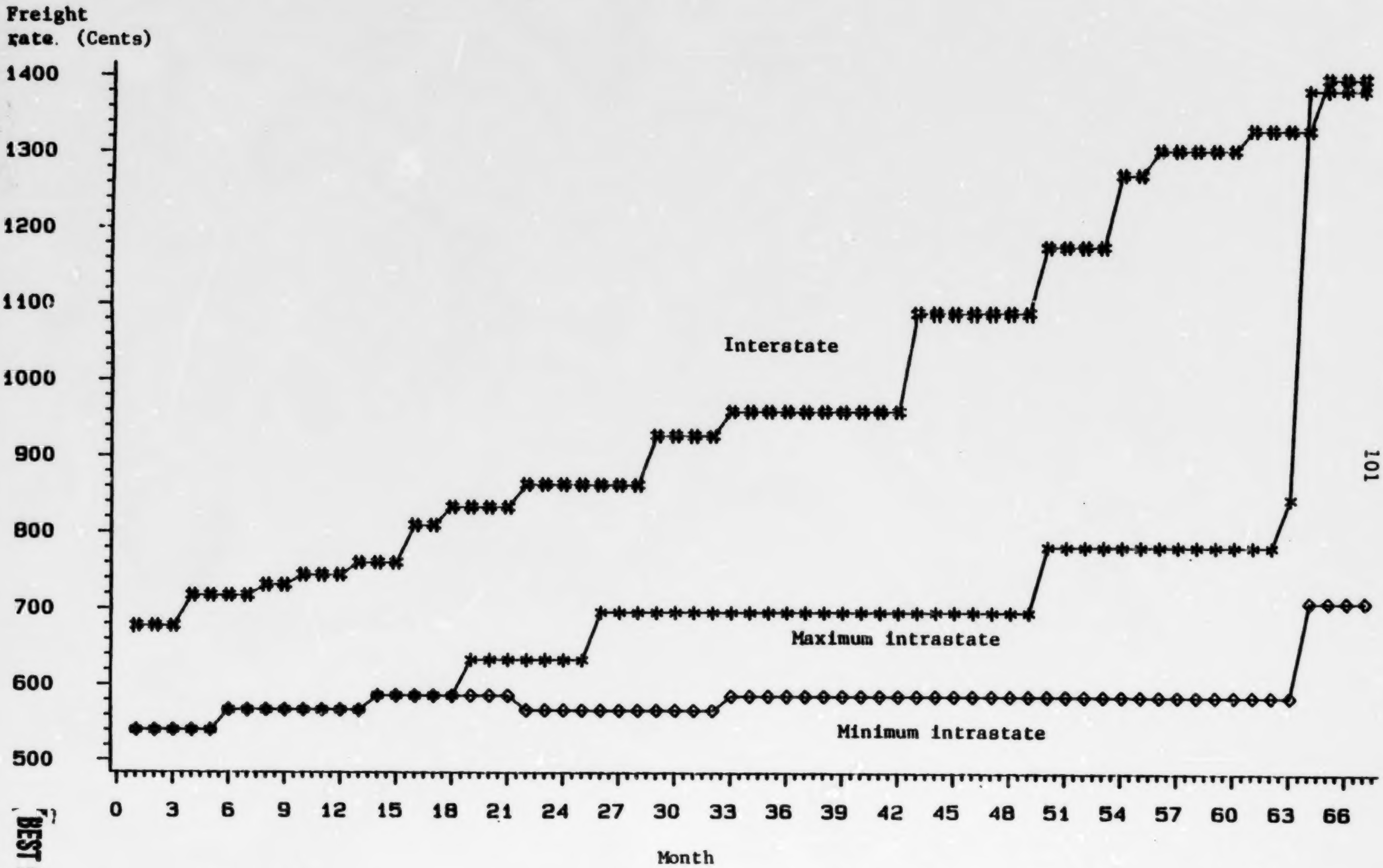

Figure 2.16 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 4, January 1979-October 1984.

NOTE: Month 1 = January 1979

101

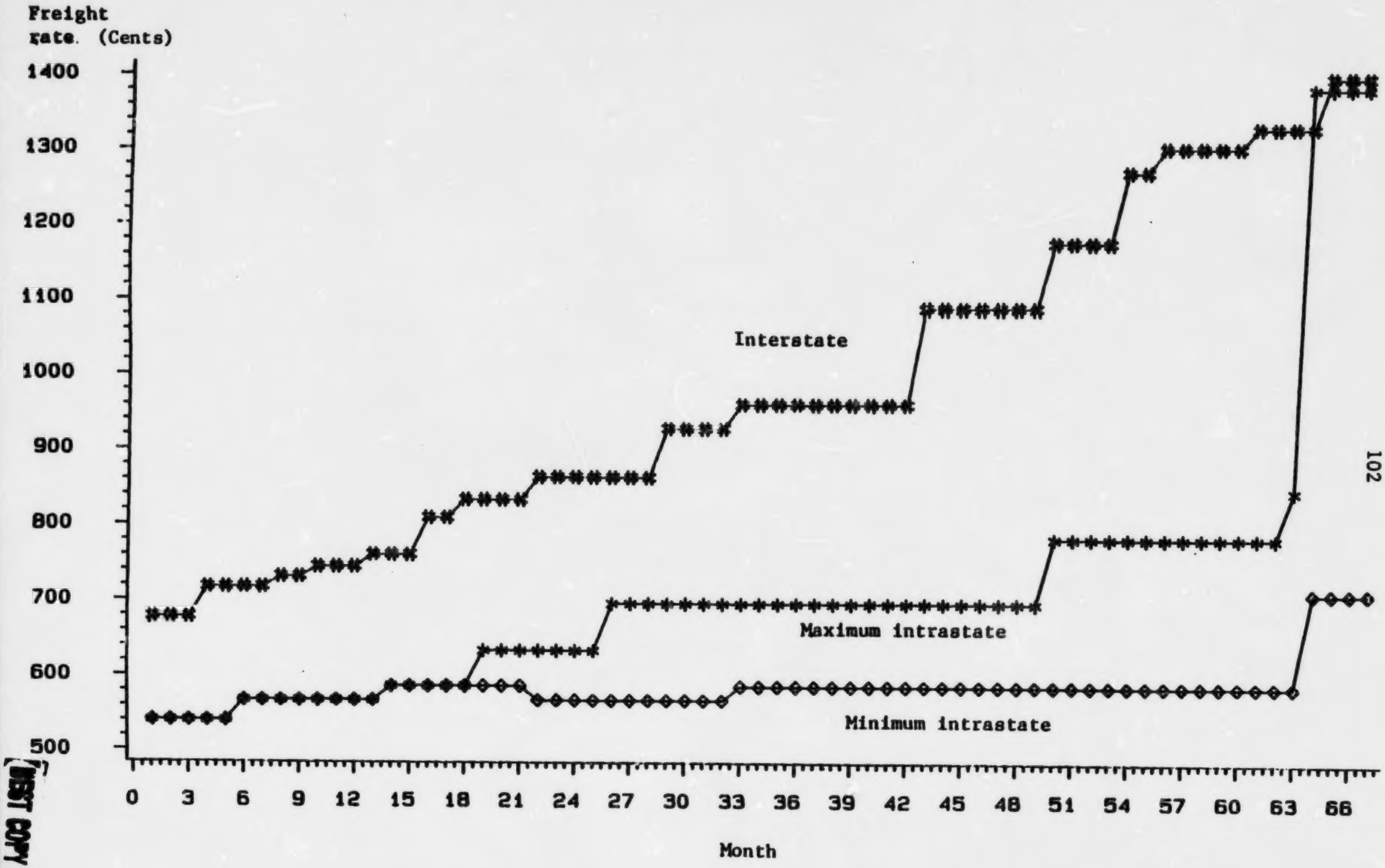

Figure 2.17 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 5, January 1979-October 11984.

NOTE: Month 1 = January 1979

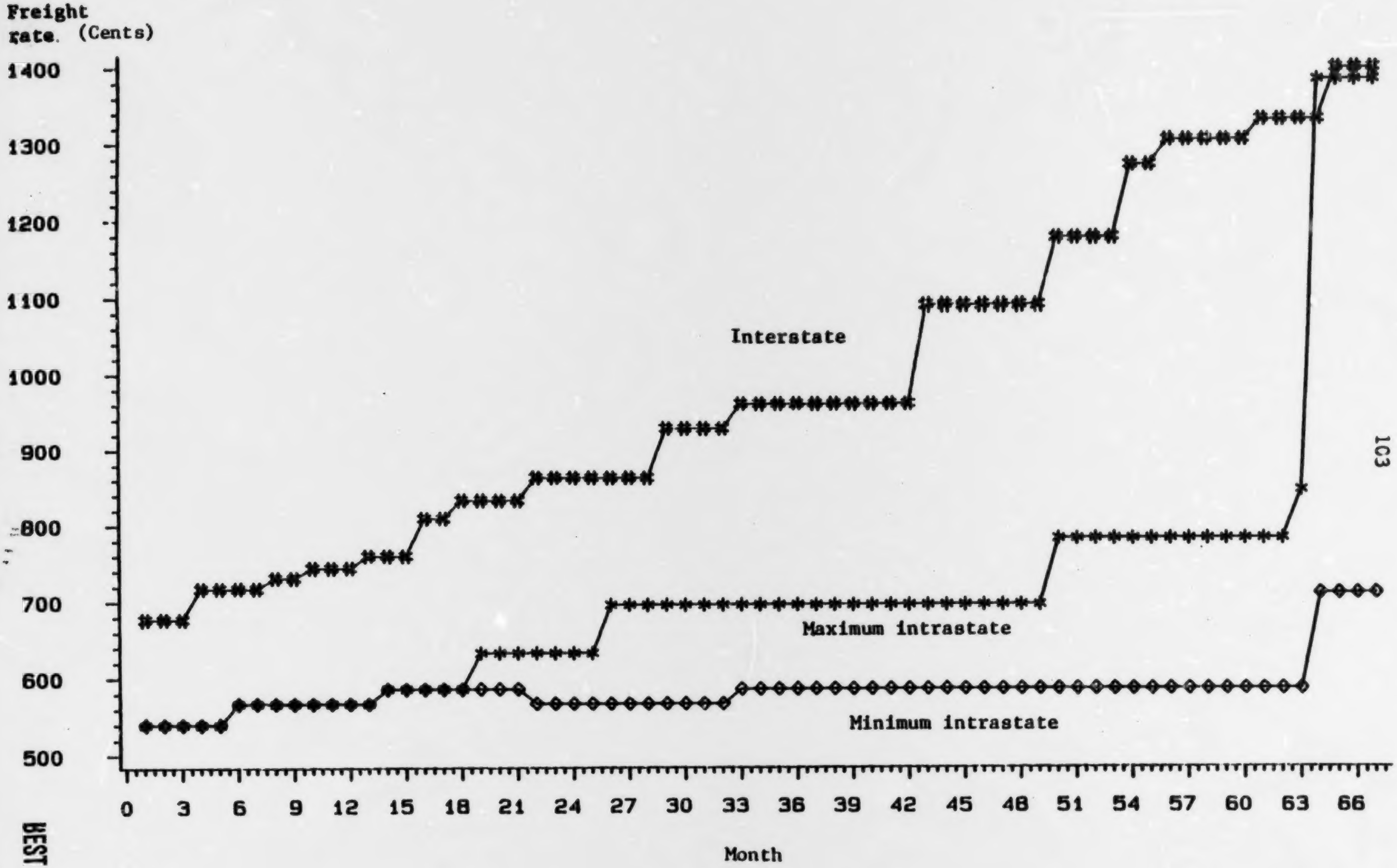

Figure 2.18 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 6, January 1979-October 1984.

NOTE: Month 1 = January 1979

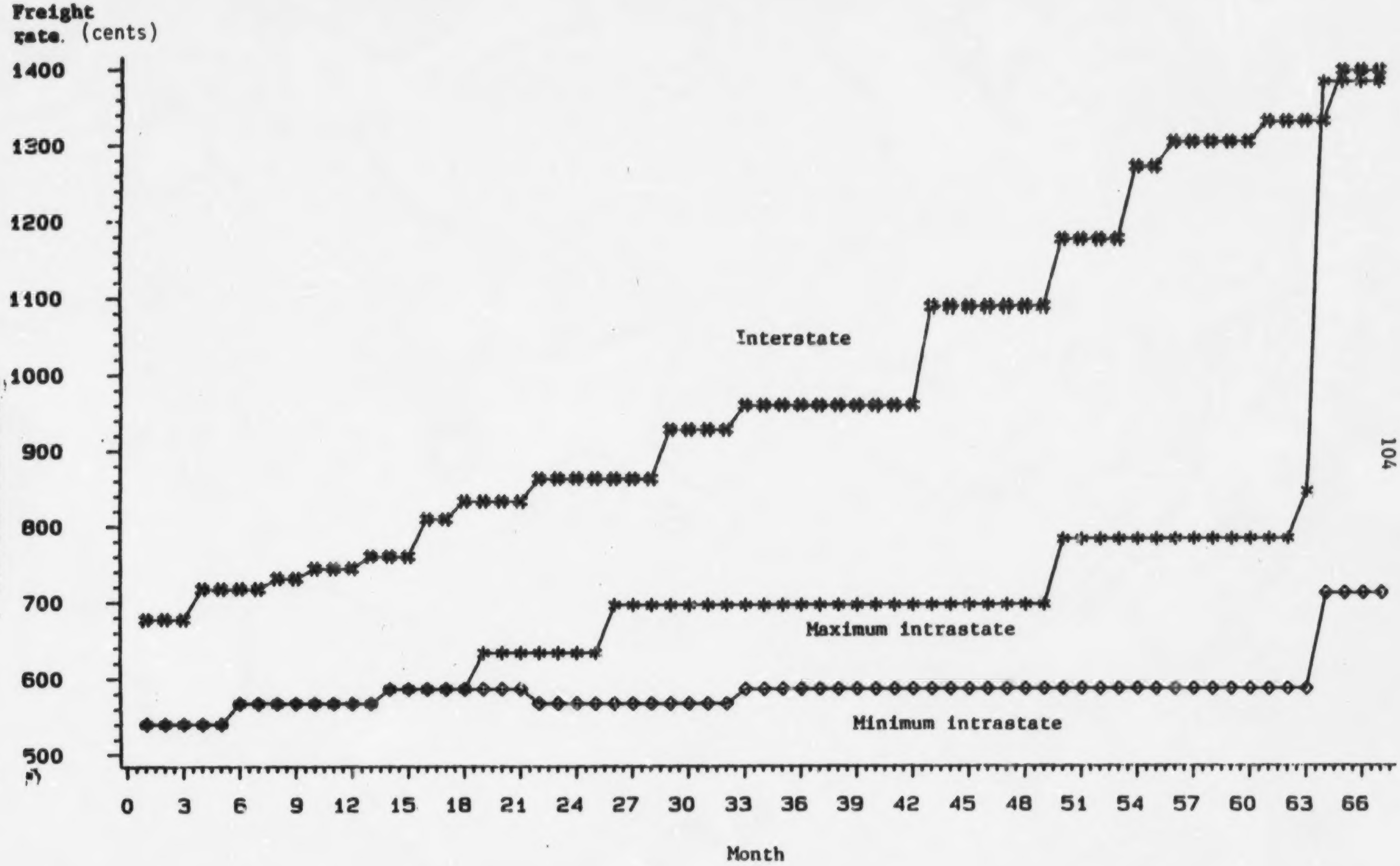

Figure 2.19 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 7., January 1979-October 1984.

NOTE: Month 1 = January 1979

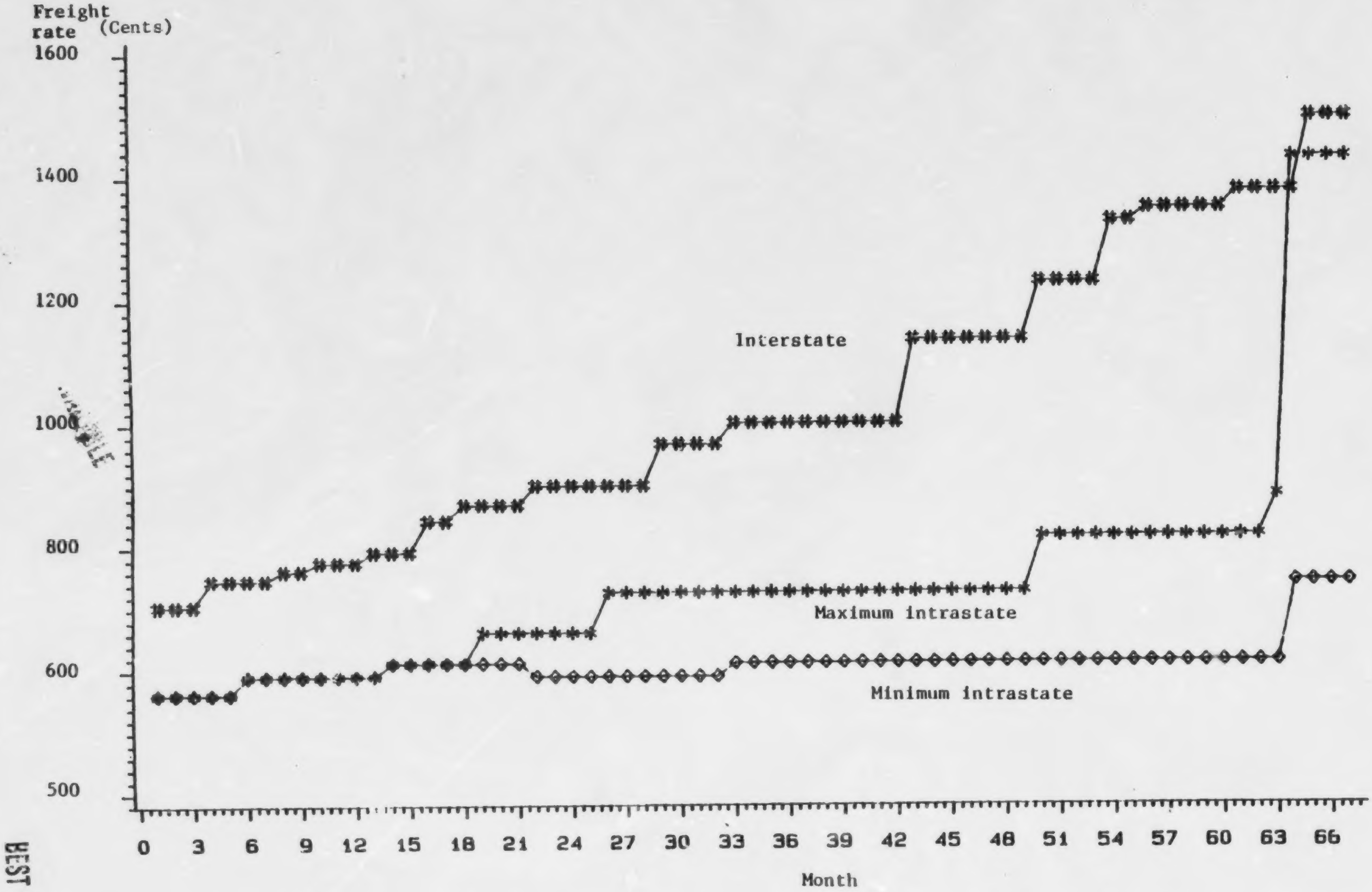

Figure 2.20 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 8, January 1979-October 1984.

NOTE: Month 1 = January 1979

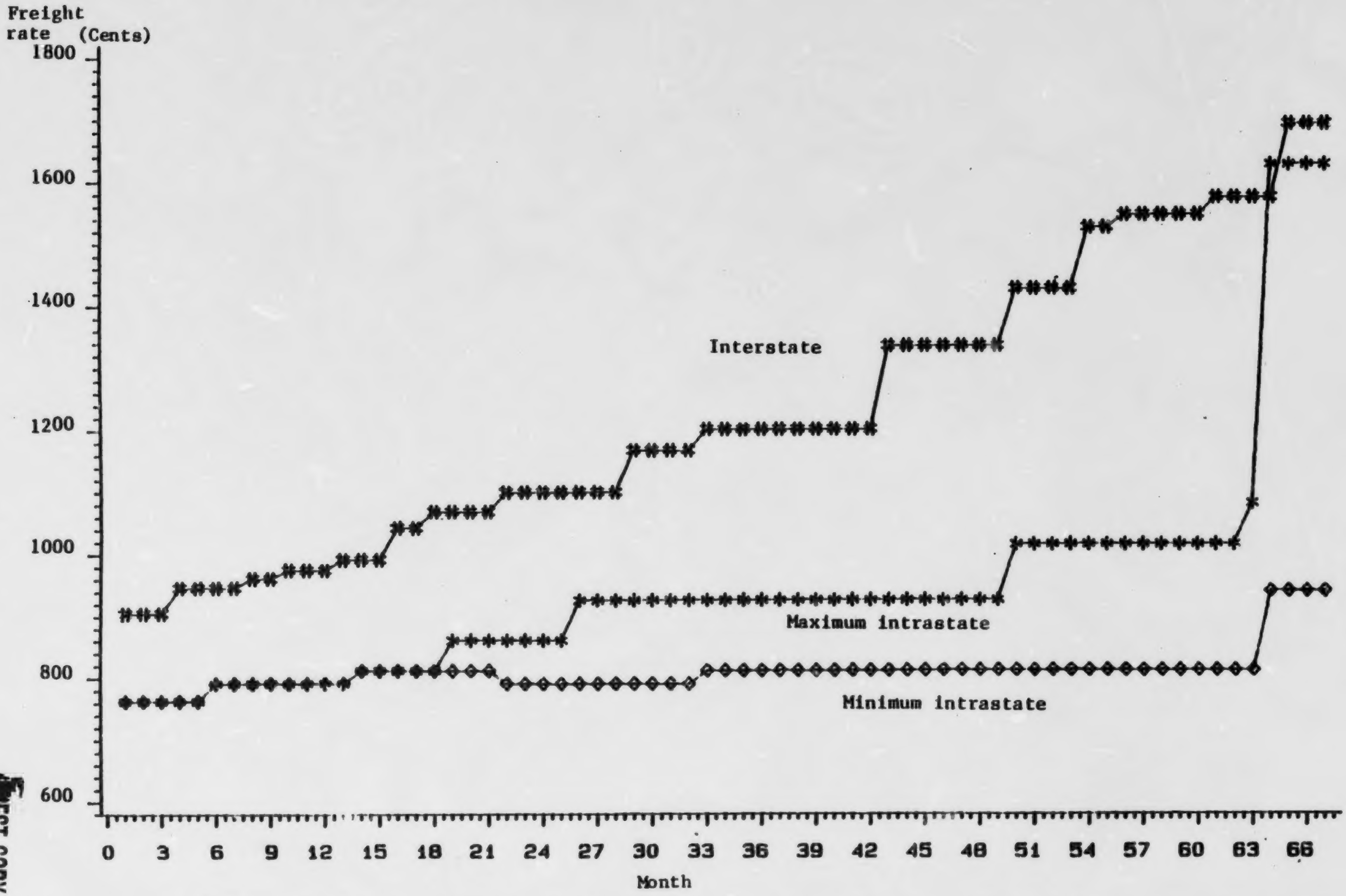

Figure 2.21 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 9, January 1979-October 1984.

NOTE: Month 1 = January 1979

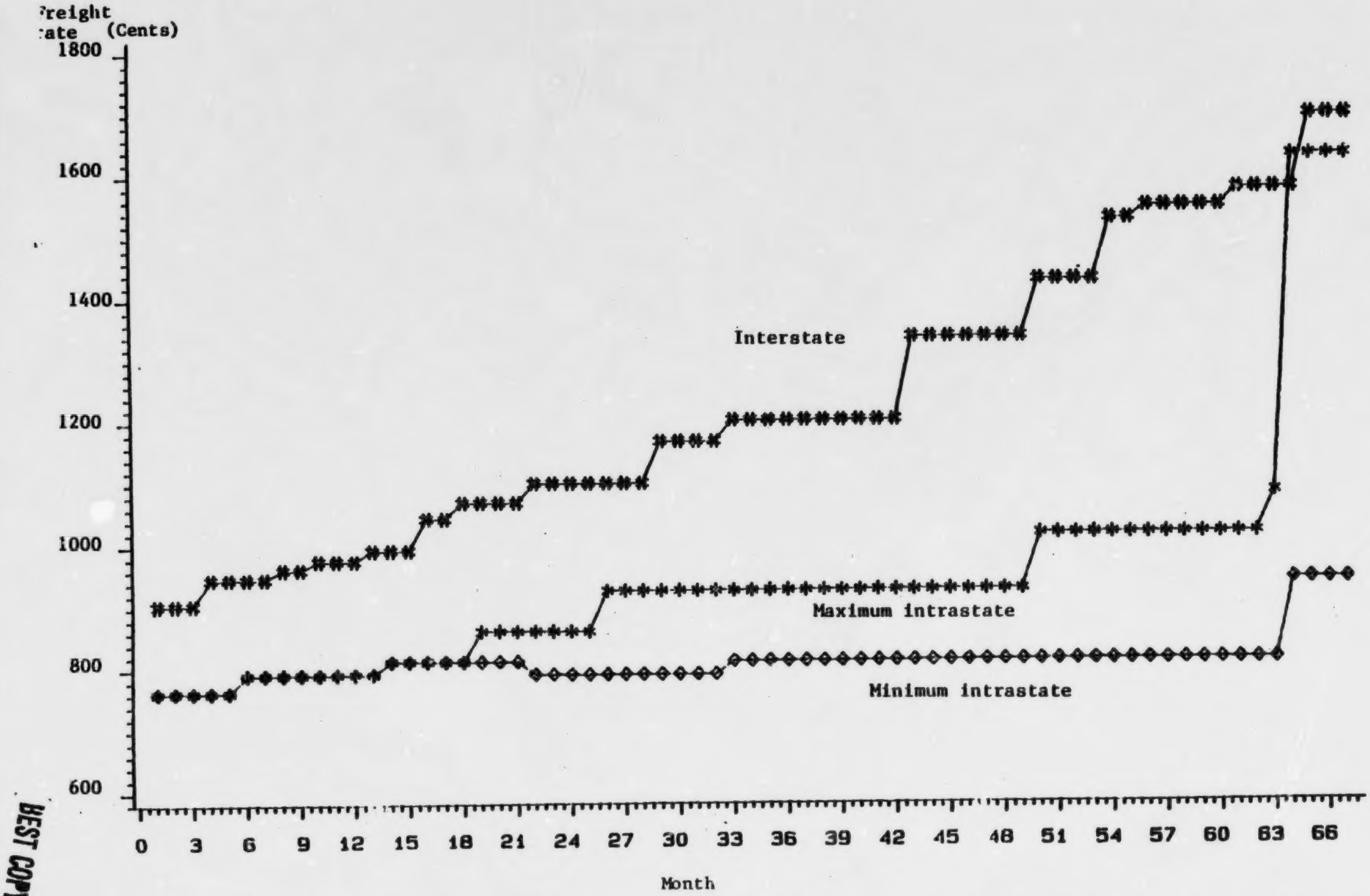

Figure 2.22 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 10, January 1979-October 1984.

NOTE: Month 1 = January 1979

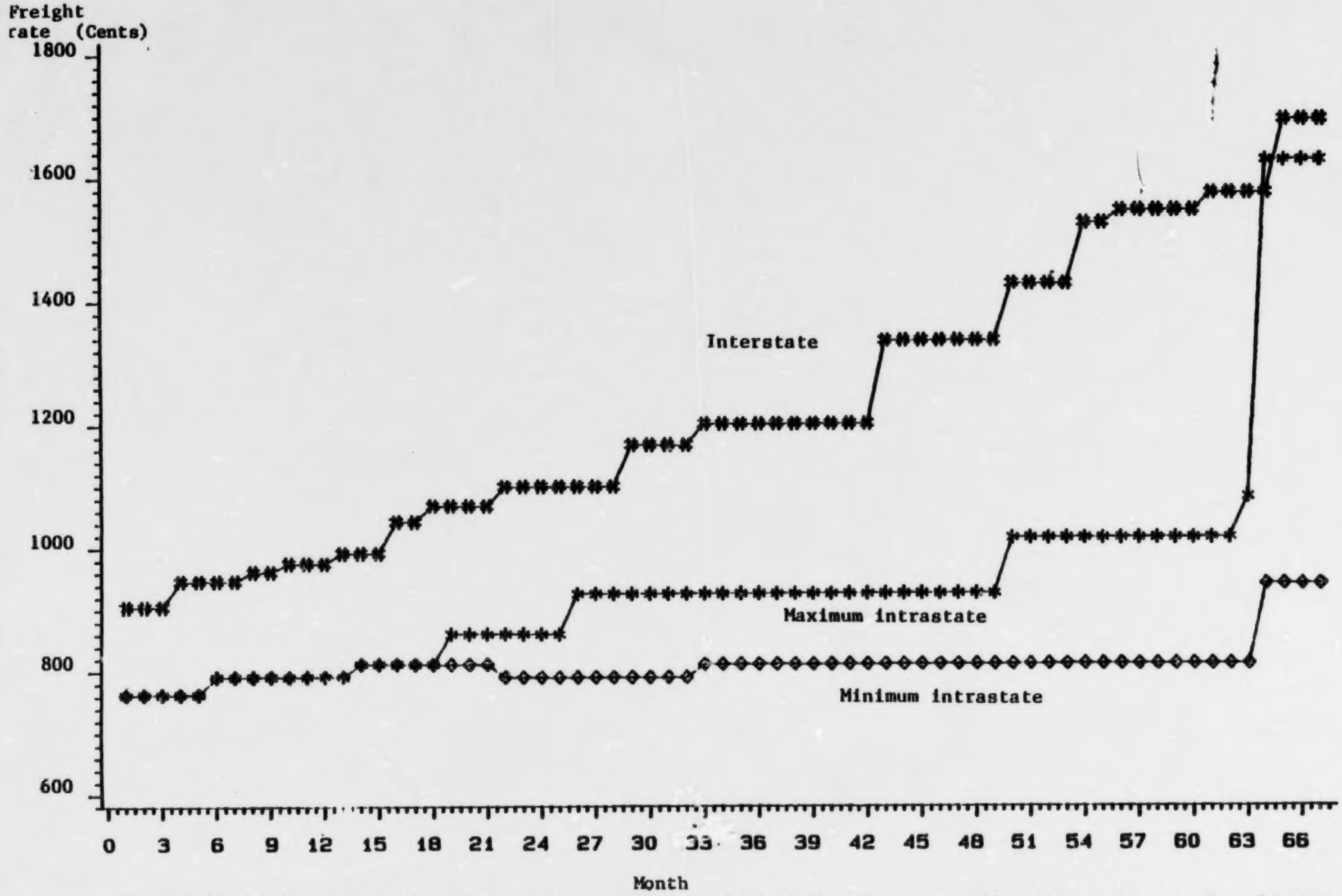

Figure 2.23 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 11, January 1979-October 1984.

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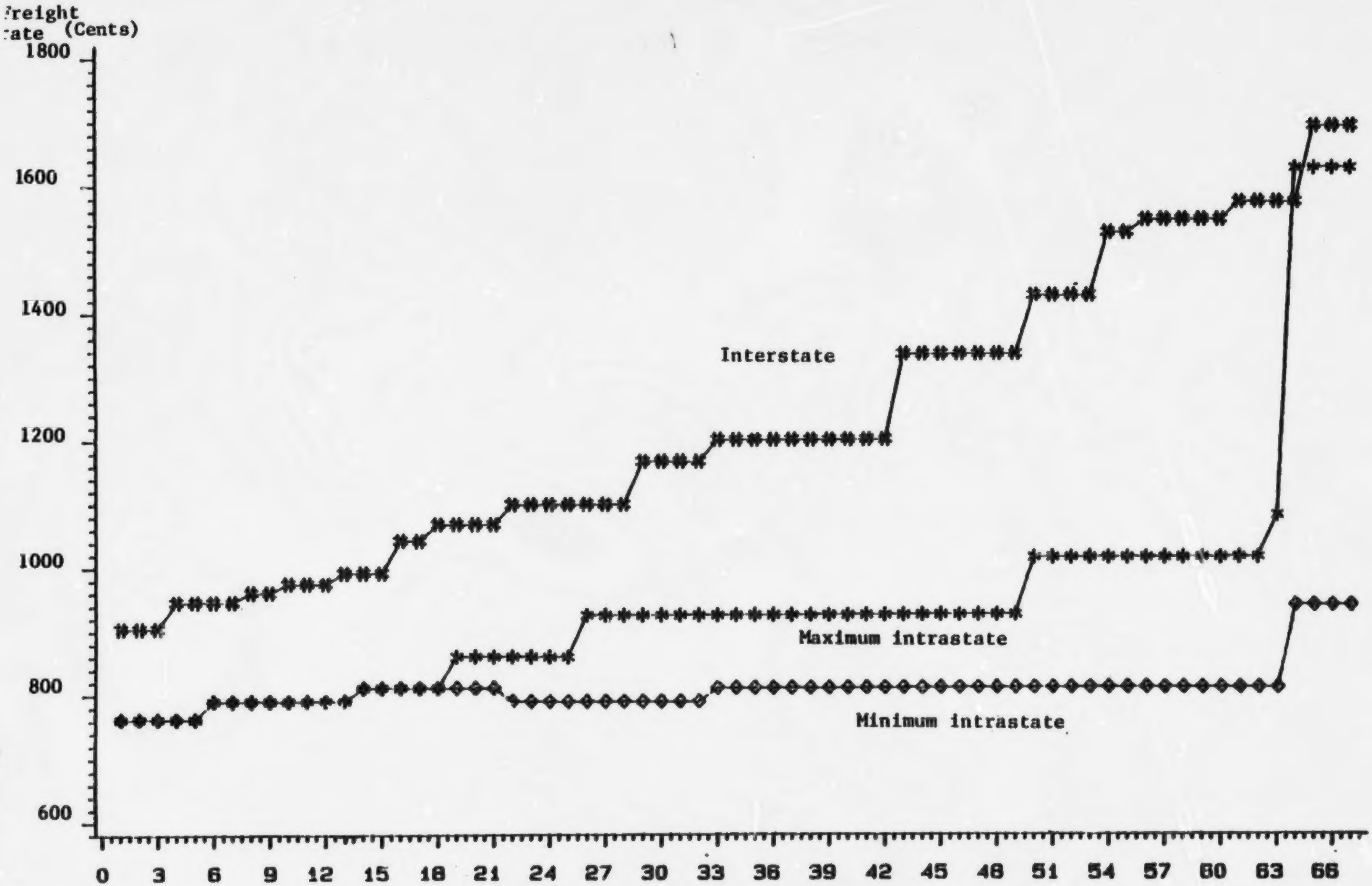

Figure 2.24 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 12, January 1979-October 1984.

NOTE: 1 = January 1979.

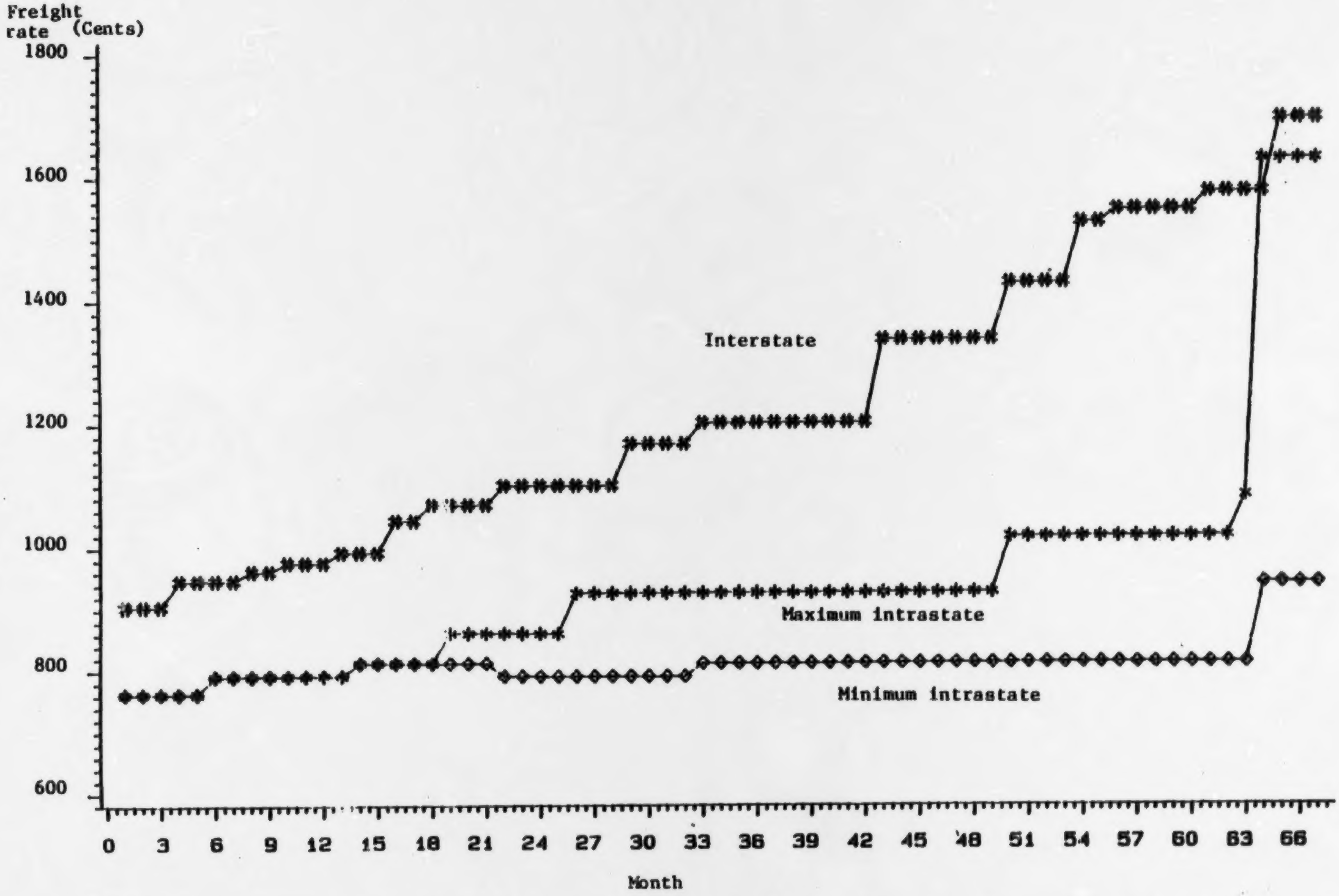

Figure 2.25 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 13, January 1979-October 1984.

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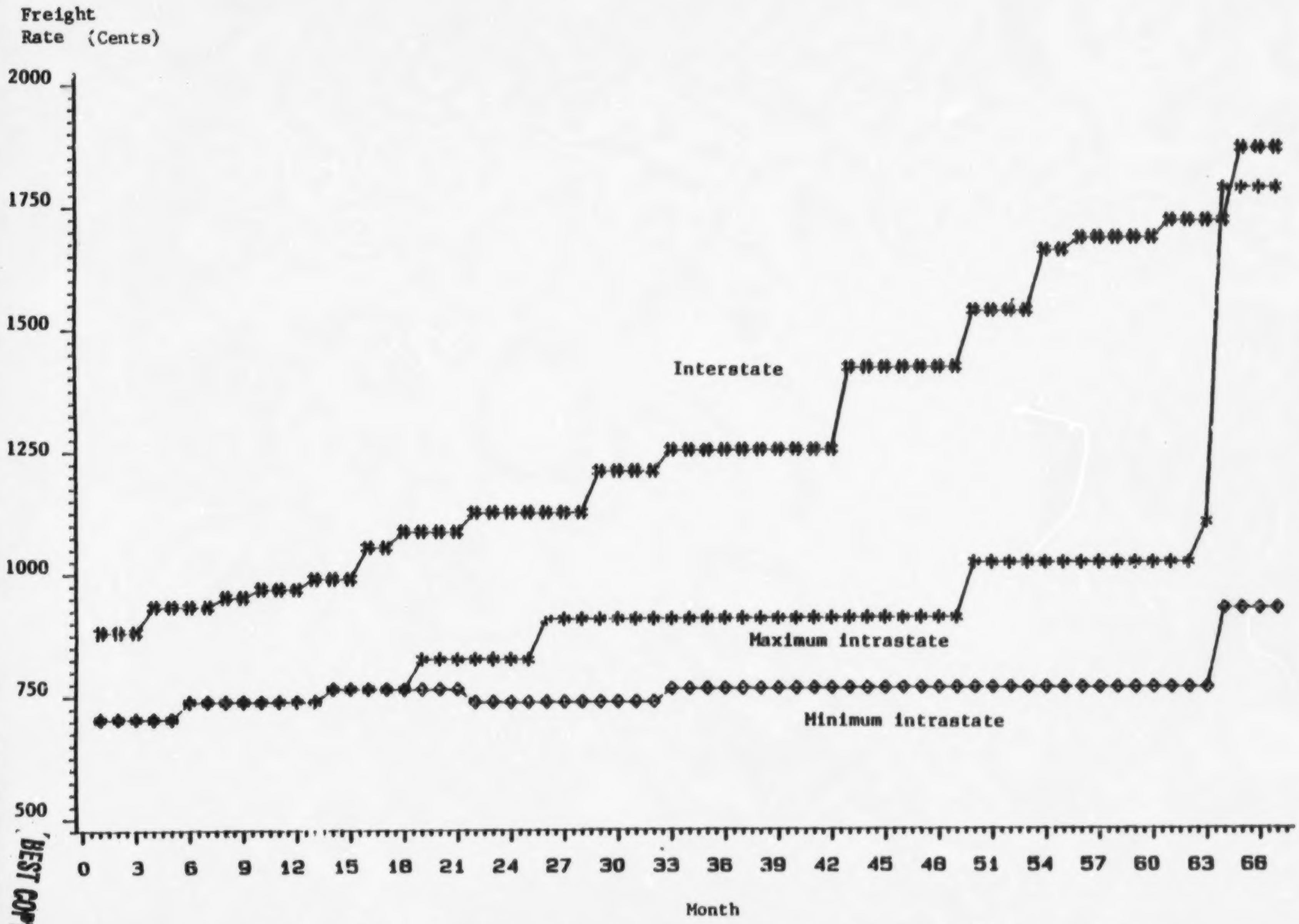

Figure 2.26 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 14, January 1979–October 1984.

NOTE: Month 1 = January 1979.

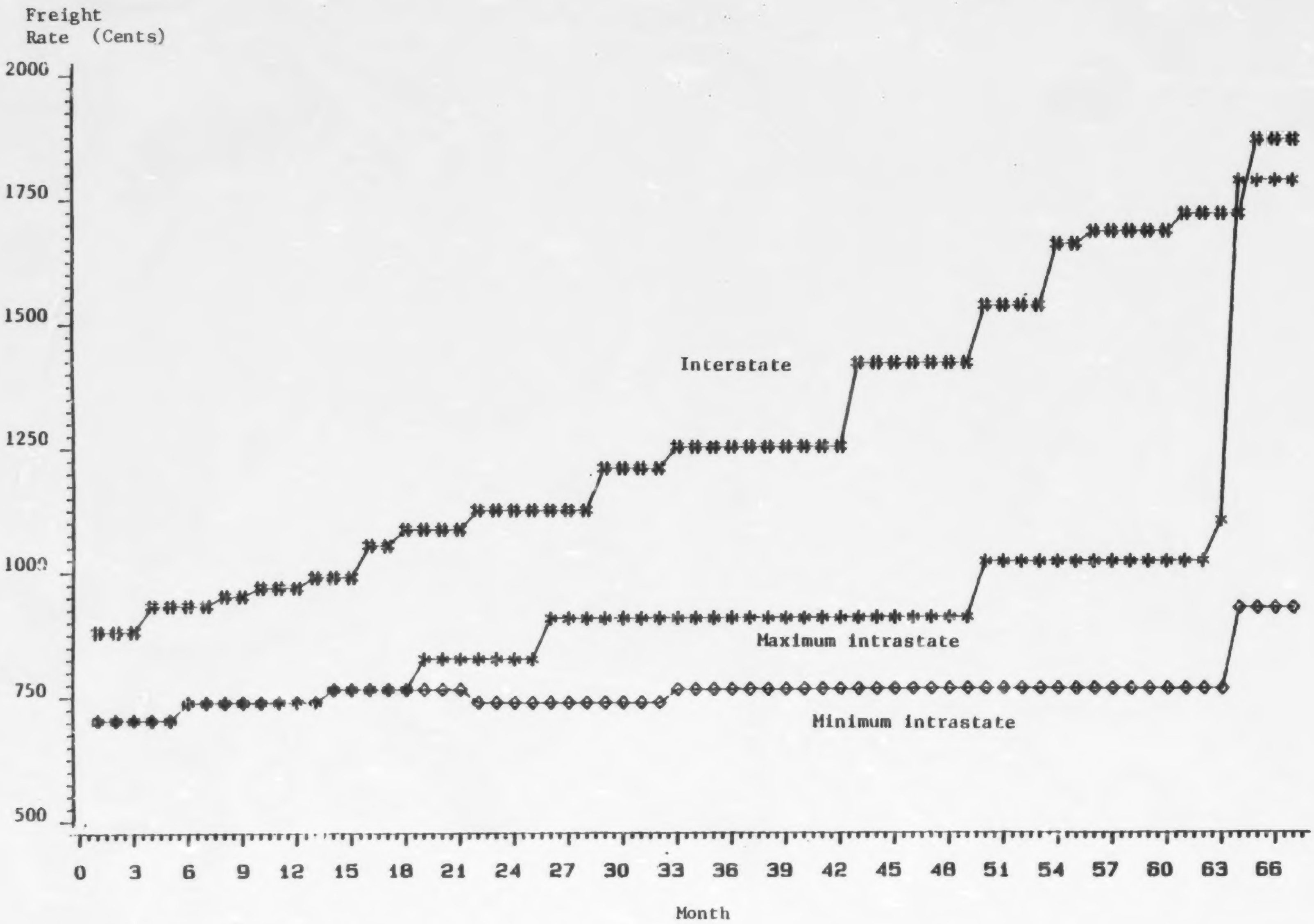

Figure 2.27 Minimum and maximum intrastate rate per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 15, January 1979-October 1984.

NOTE: Month 1 = January 1979.

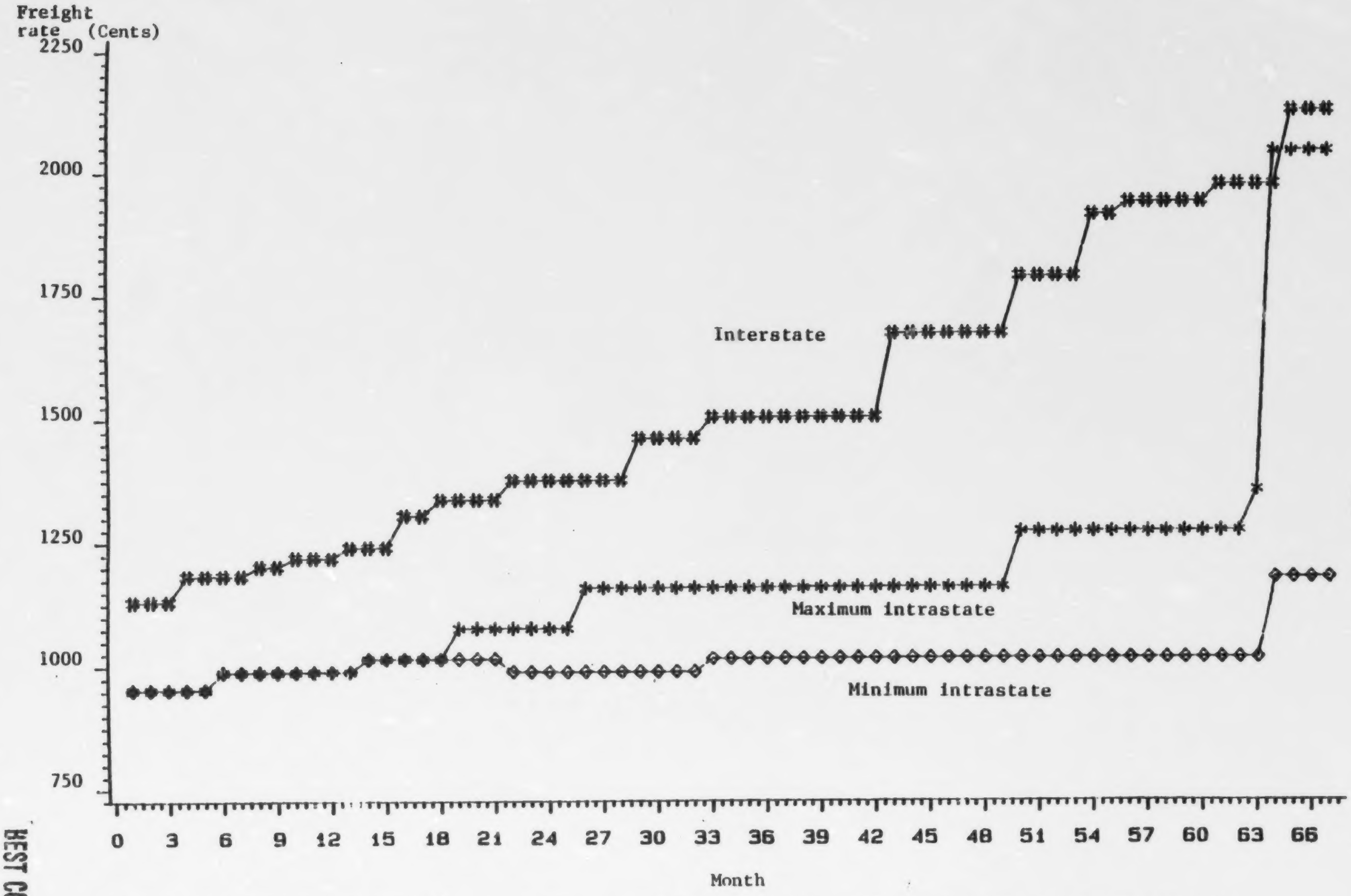

Figure 2.28 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 16, January 1979-October 1984.

NOTE: Month 1 = January 1979.

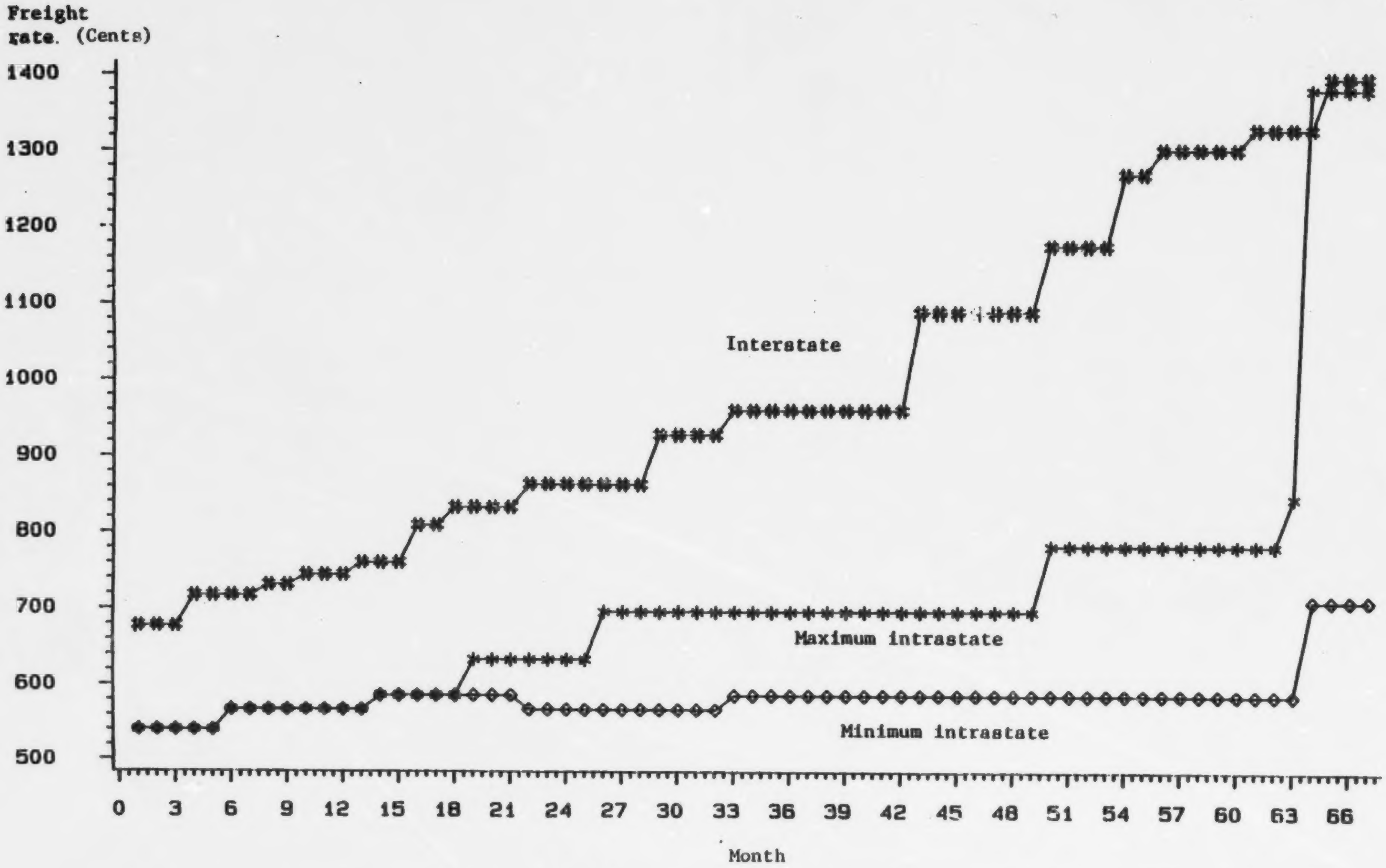

Figure 2.29 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 17, January 1979-October 1984.

NOTE: Month 1 = January 1979.

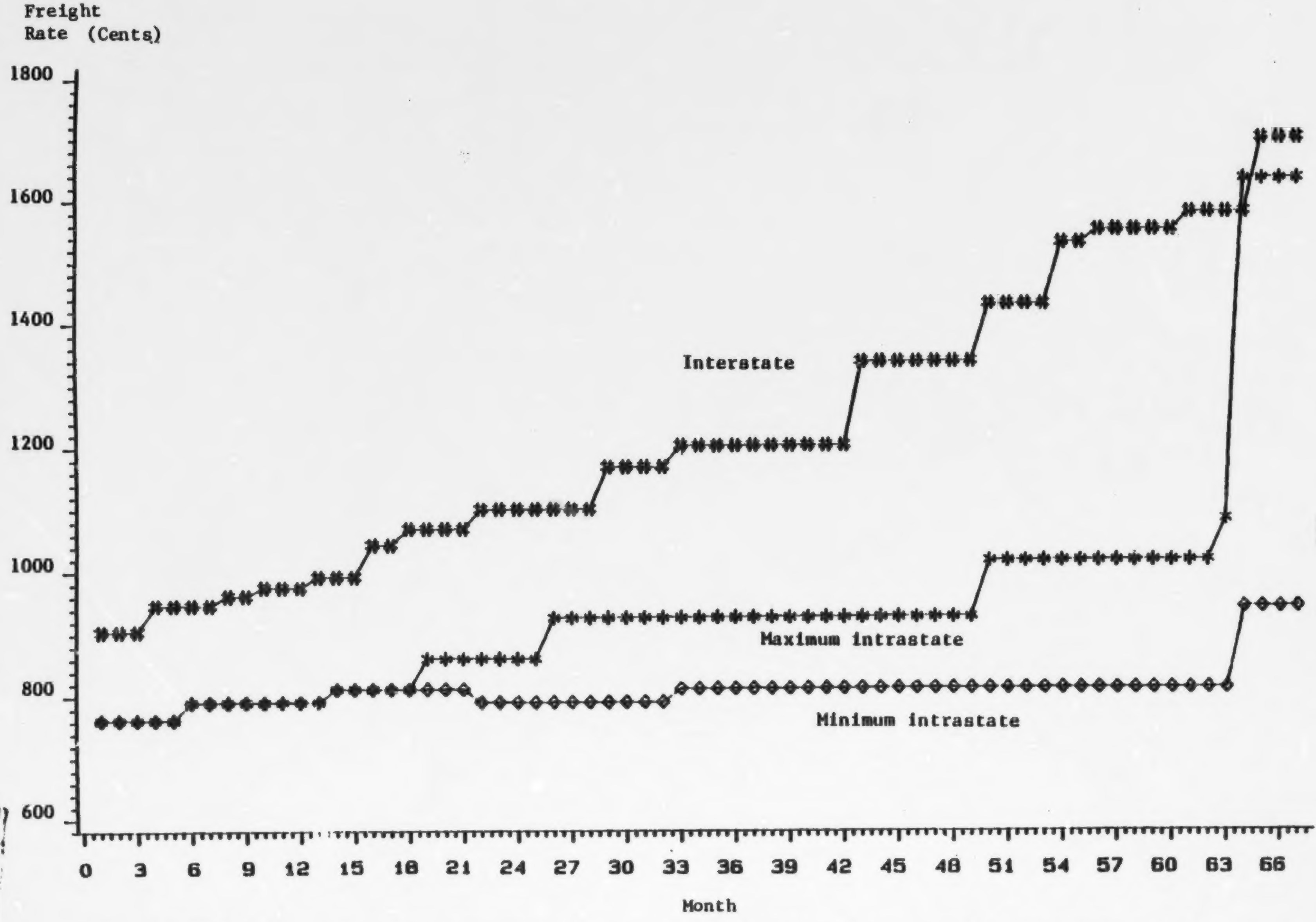

Figure 2.30 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 18, January 1979-October 1984.

NOTE: Month 1 = January 1979.

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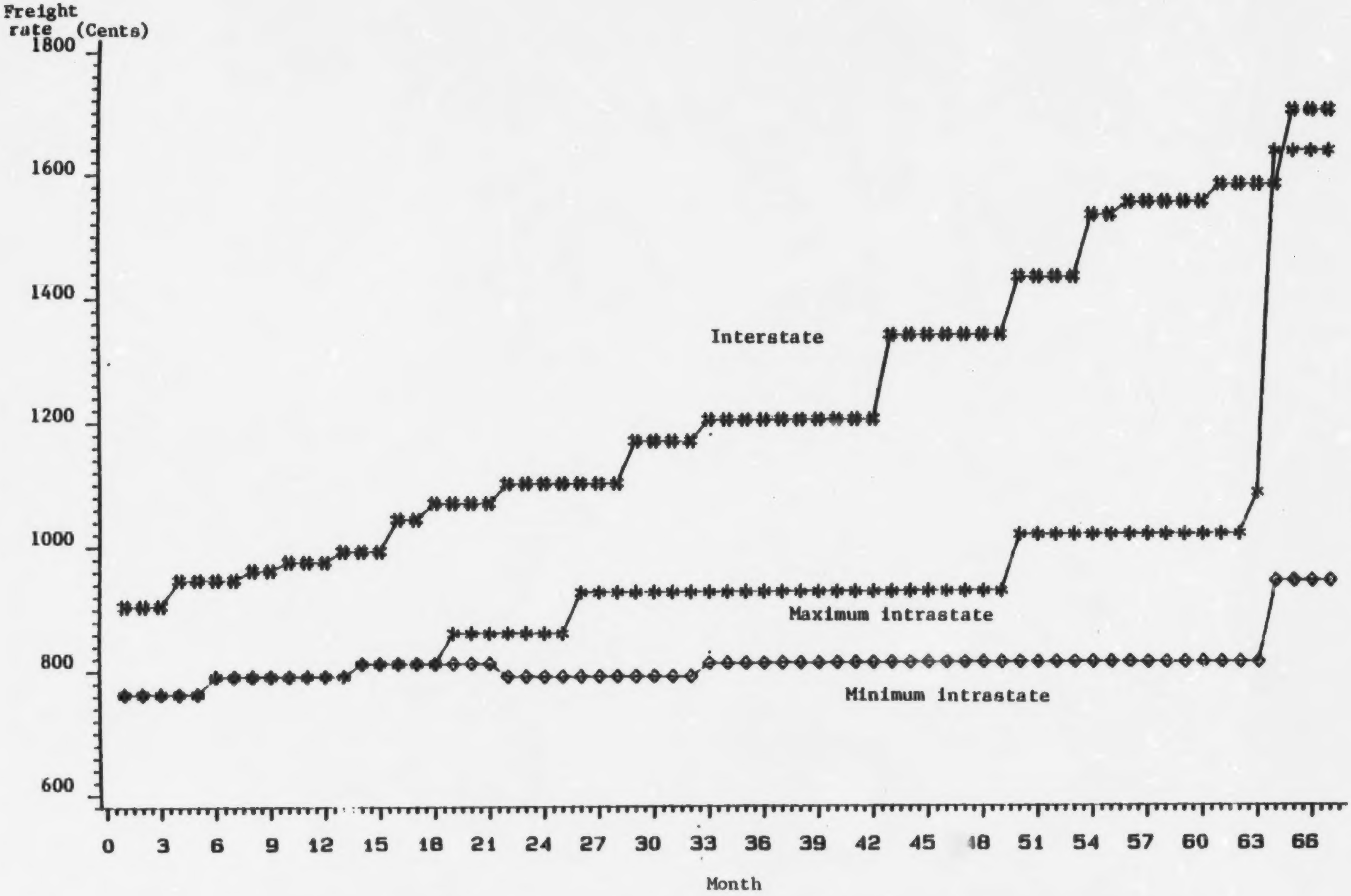

Figure 2.31 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 19, January 1979-October 1984.

NOTE: Month 1 = January 1979.

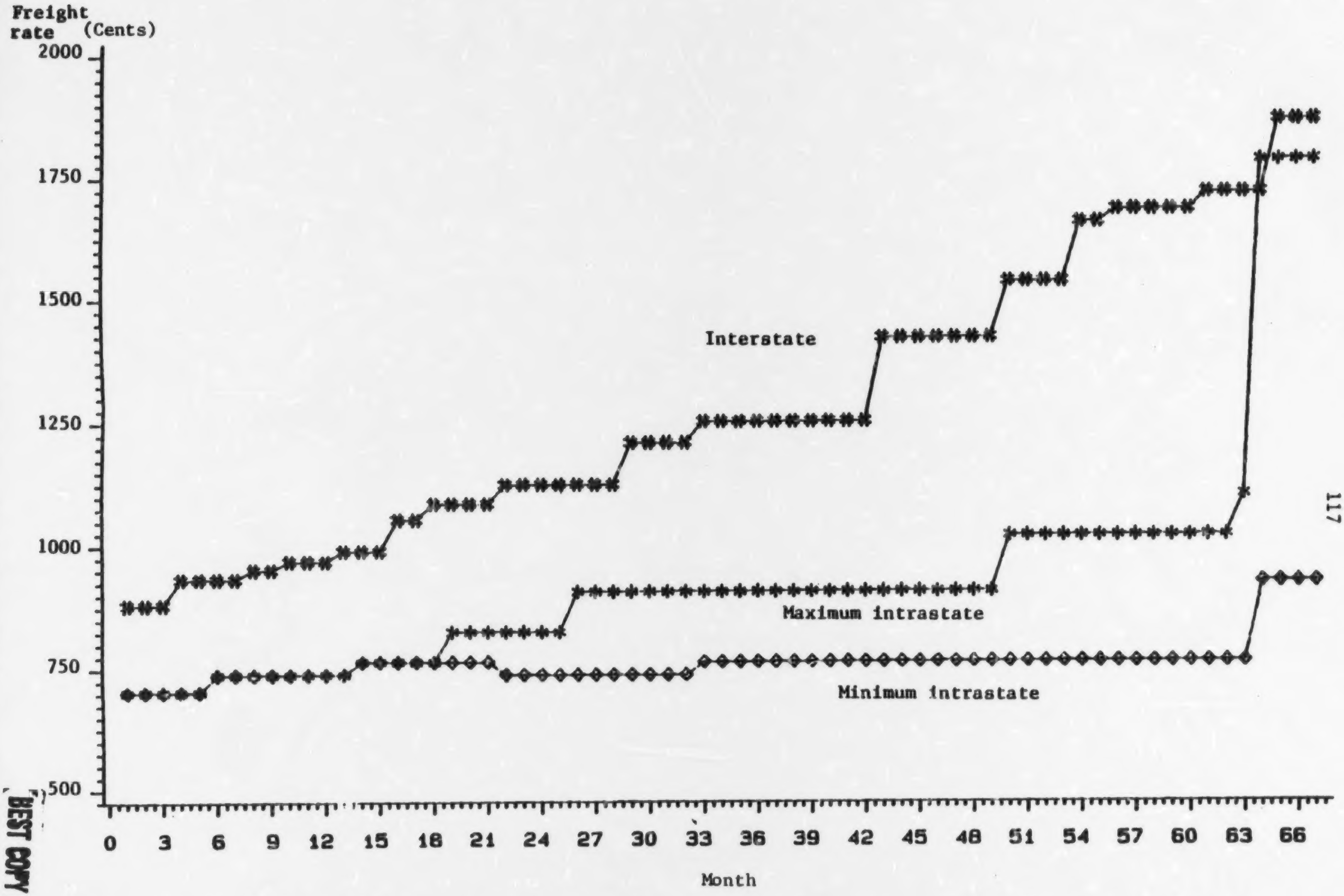

Figure 2.32 Minimum and maximum intrastate rates per hundredweight and corresponding interstate rate for shipment weight class under 500 pounds, Florida Route 20, January 1979-October 1984.

NOTE: Month 1 = January 1979.

APPENDIX 3

RATIO OF RATES FOR HIGHEST AND LOWEST WEIGHT CATEGORIES

ARIZONA

JANUARY 1980 - OCTOBER 1984

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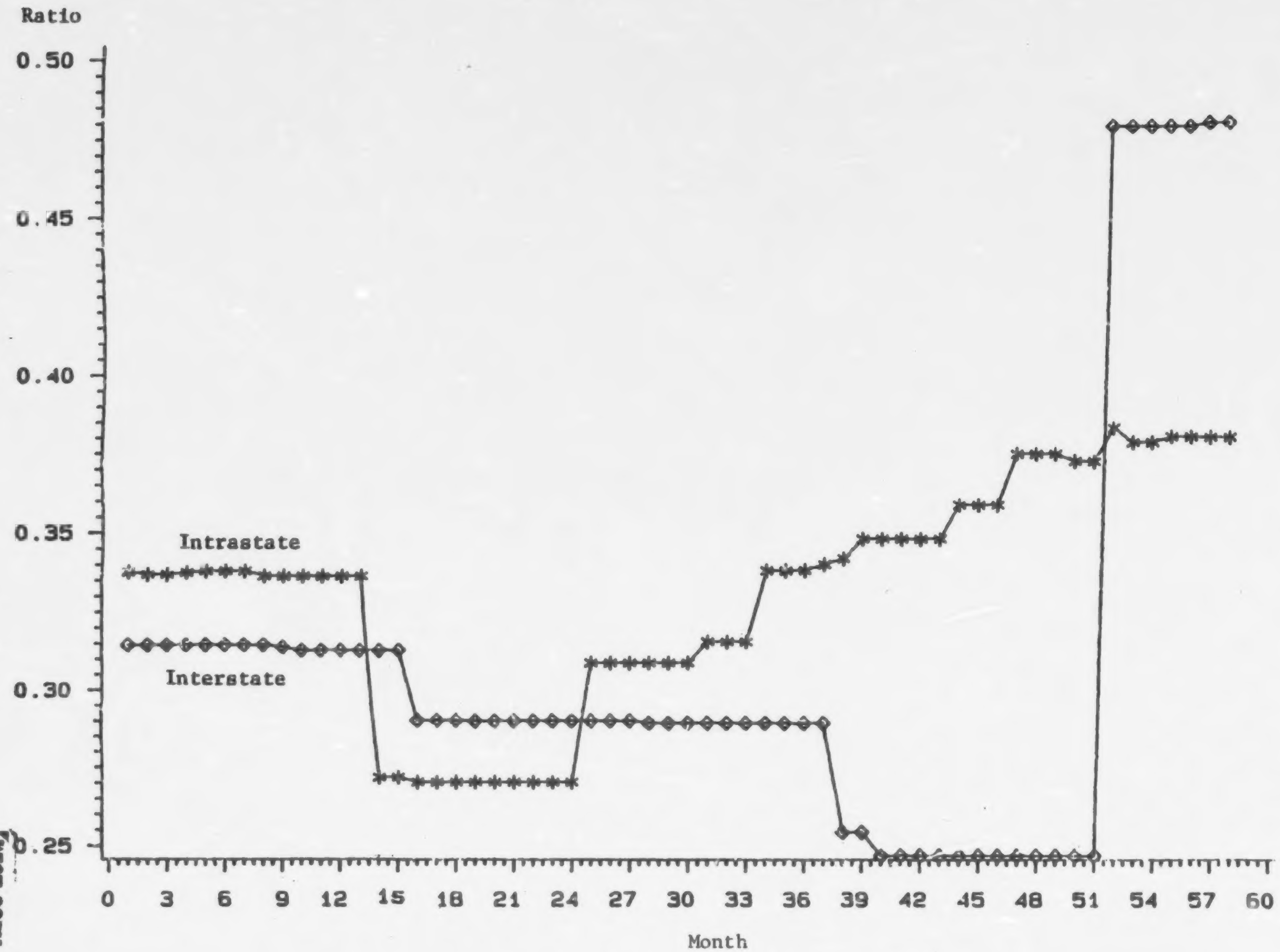

Figure 3.1 Ratio of commodity class 100 freight rates for shipment weight categories over 10,000 pounds and under 1,000 pounds, Arizona Route 1, January 1980-October 1984.

NOTE: Month 1 = January 1980.

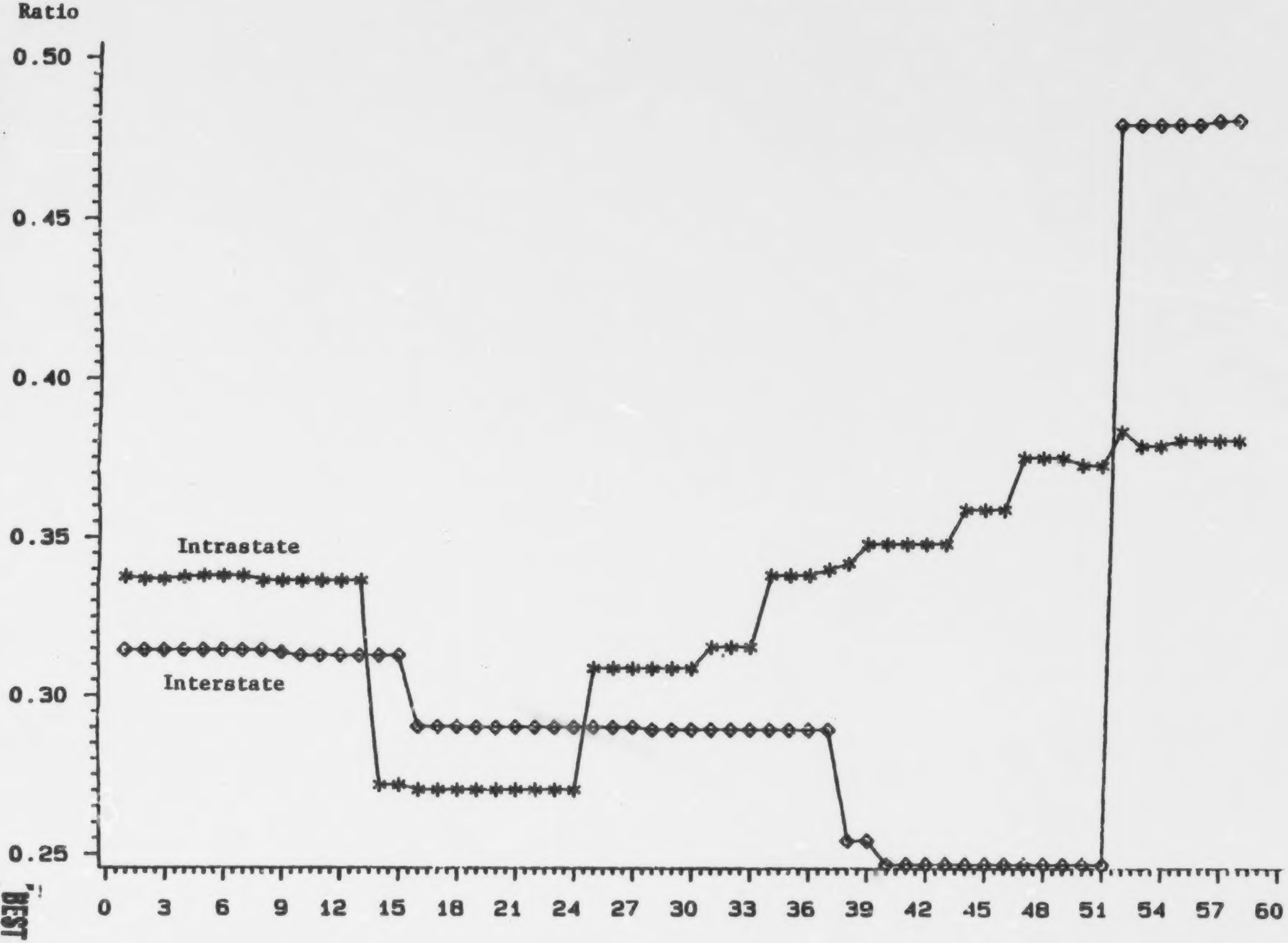

Figure 3.2 Ratio of commodity class 100 freight rates for shipment weight categories over 10,000 pounds and under 1,000 pounds, Arizona Route 2, January 1980-October 1984.

NOTE: Month 1 = January 1980. 121

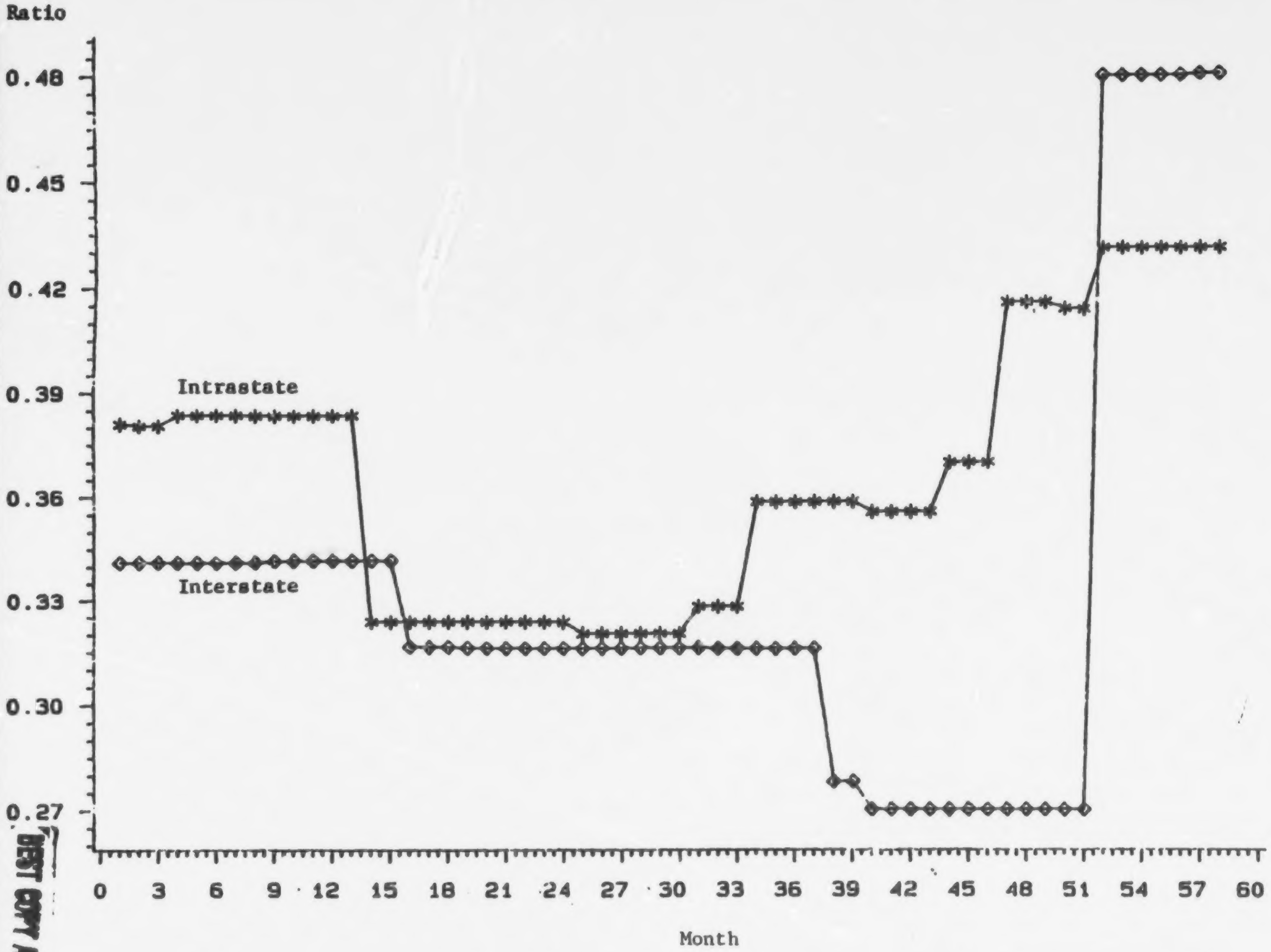

Figure 3.3 Ratio of commodity class 100 freight rates for shipment weight categories over 10,00 pounds and under 1,000 pounds, Arizona Route 3, January 1980-October 1984.

NOTE: Month 1 = January 1980.

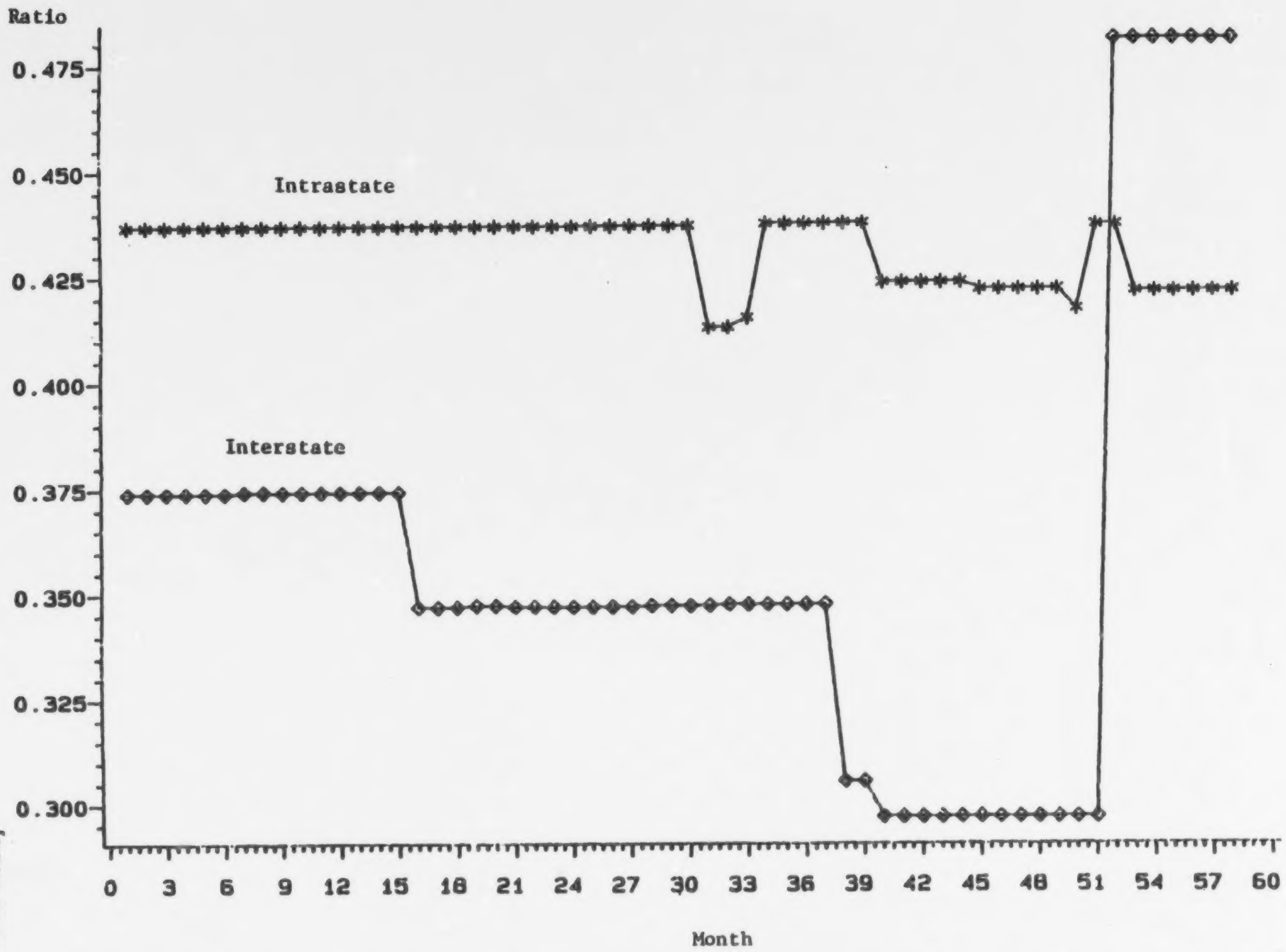

Figure 3.4 Ratio of commodity class 100 freight rates for shipment weight categories over 10,000 pounds and under 1,000 pounds, Arizona Route 4, January 1980-October 1984.

NOTE: Month 1 = January 1980.

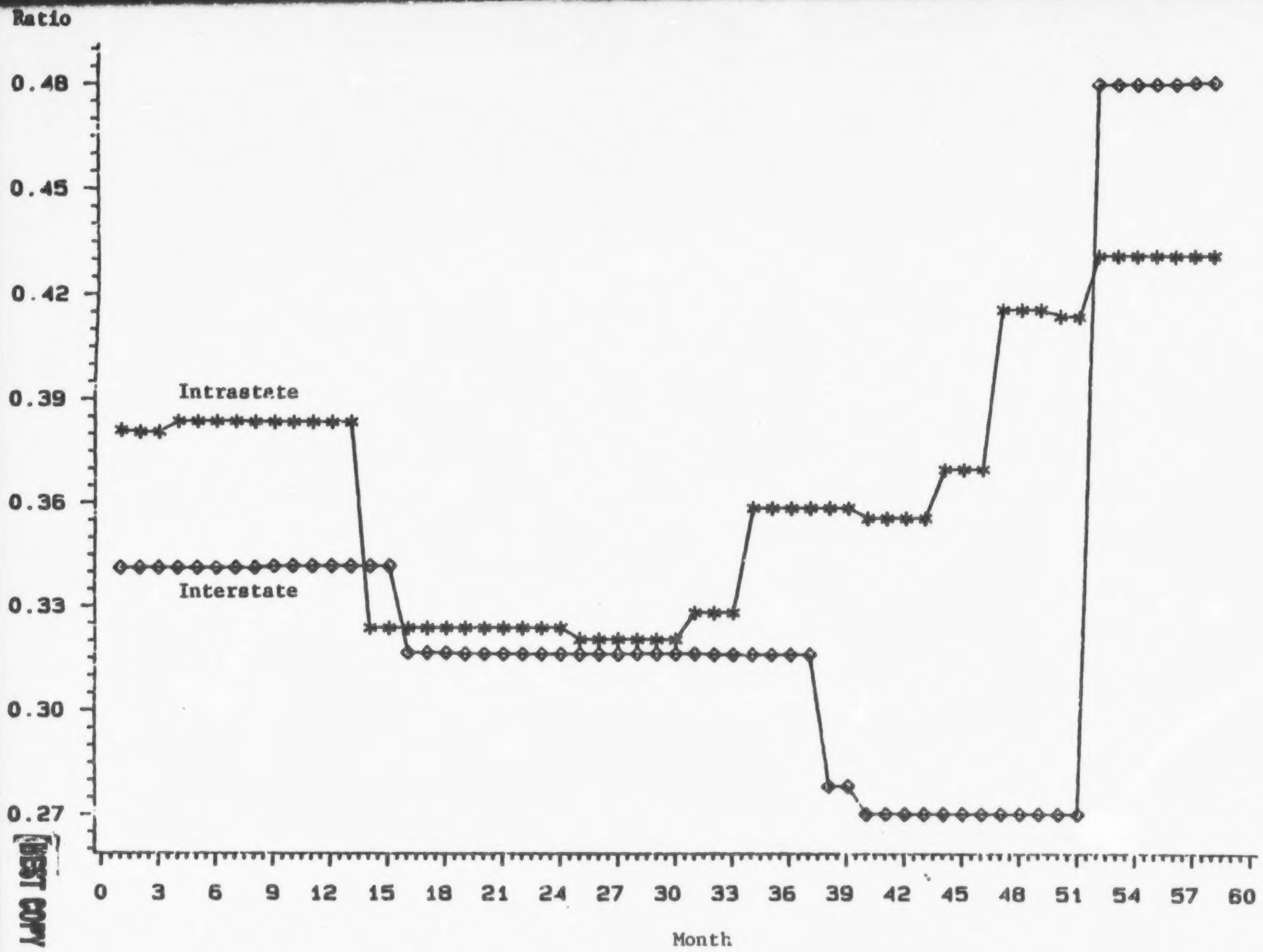

Figure 3.5 Ratio of commodity class 100 frieght rates for shipment weight categories over 10,000 pounds and under 1,000 pounds, Arizona Route 5, January 1980-October 1984.

NOTE: Month 1 = January 1980.

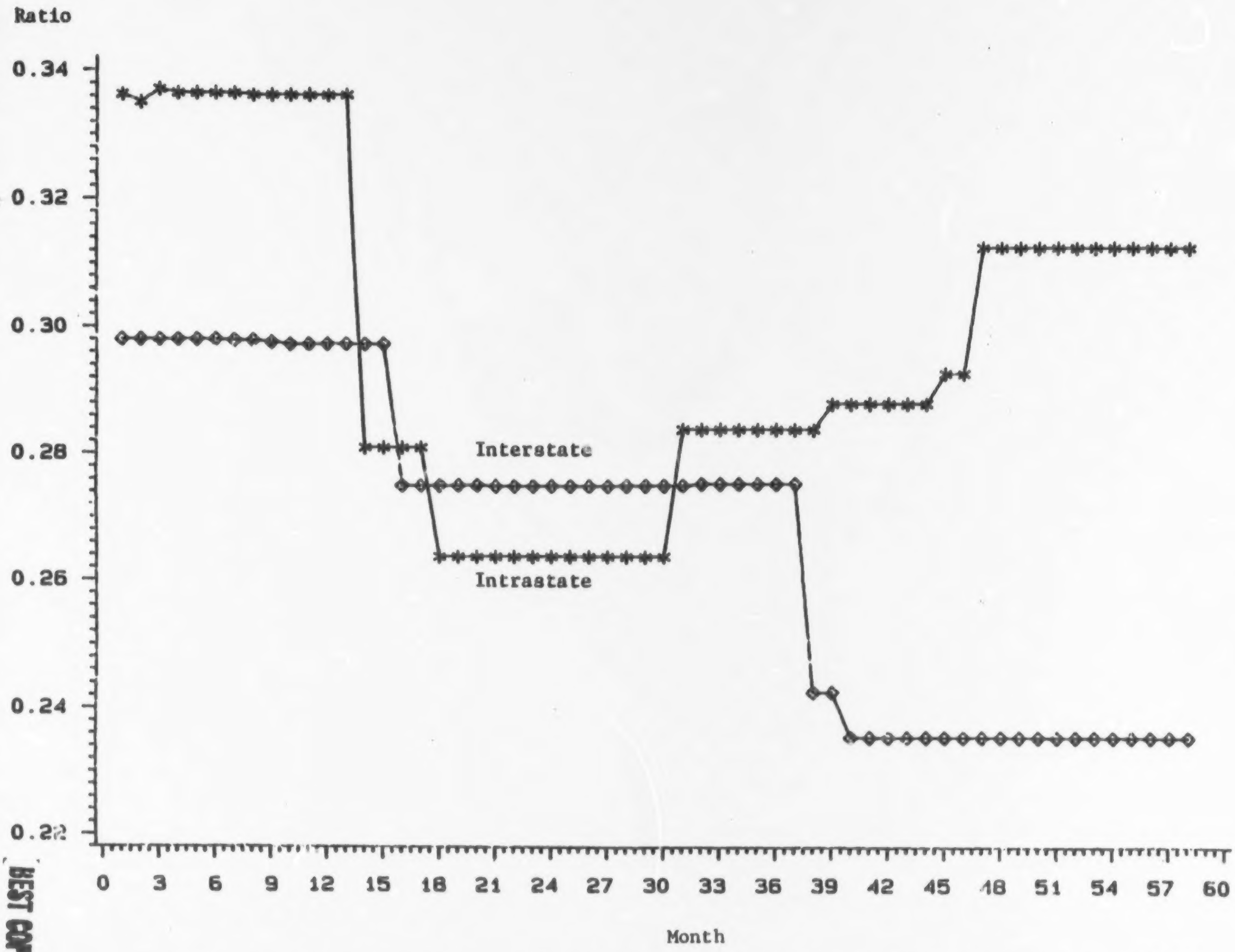

Figure 3.6 Ratio of commodity class 100 freight rates for shipment weight categories over 10,000 pounds and under 1,000 pounds, Arizona Route 6, January 1980-October 1984.

NOTE: Month 1 = January 1980.

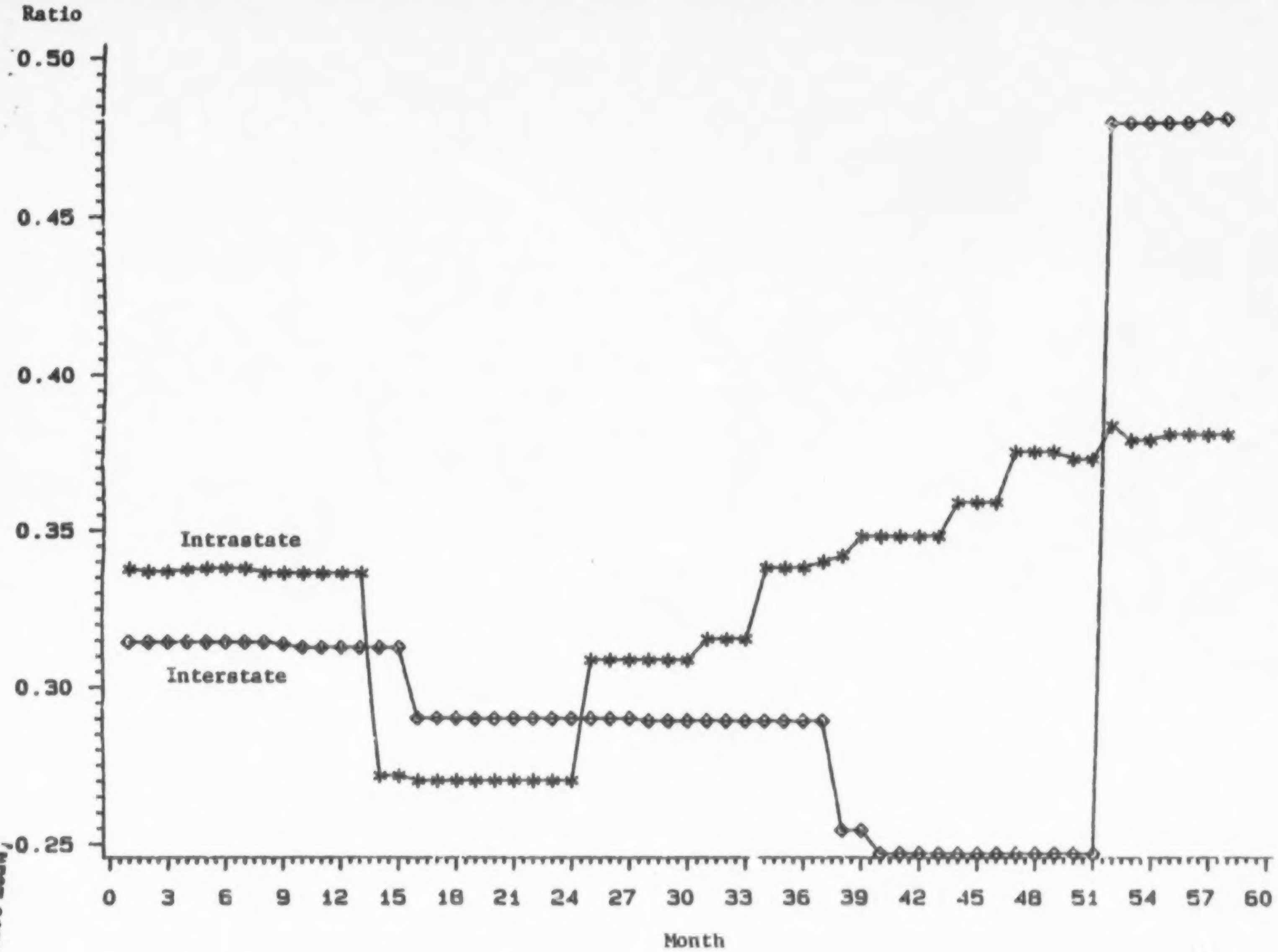

Figure 3.7 Ratio of commodity class 100 freight rates for shipment weight categories over 10,000 pounds and under 1,000 pounds, Arizona Route 7, January 1980-October 1984.

NOTE: Month 1 = January 1980 126

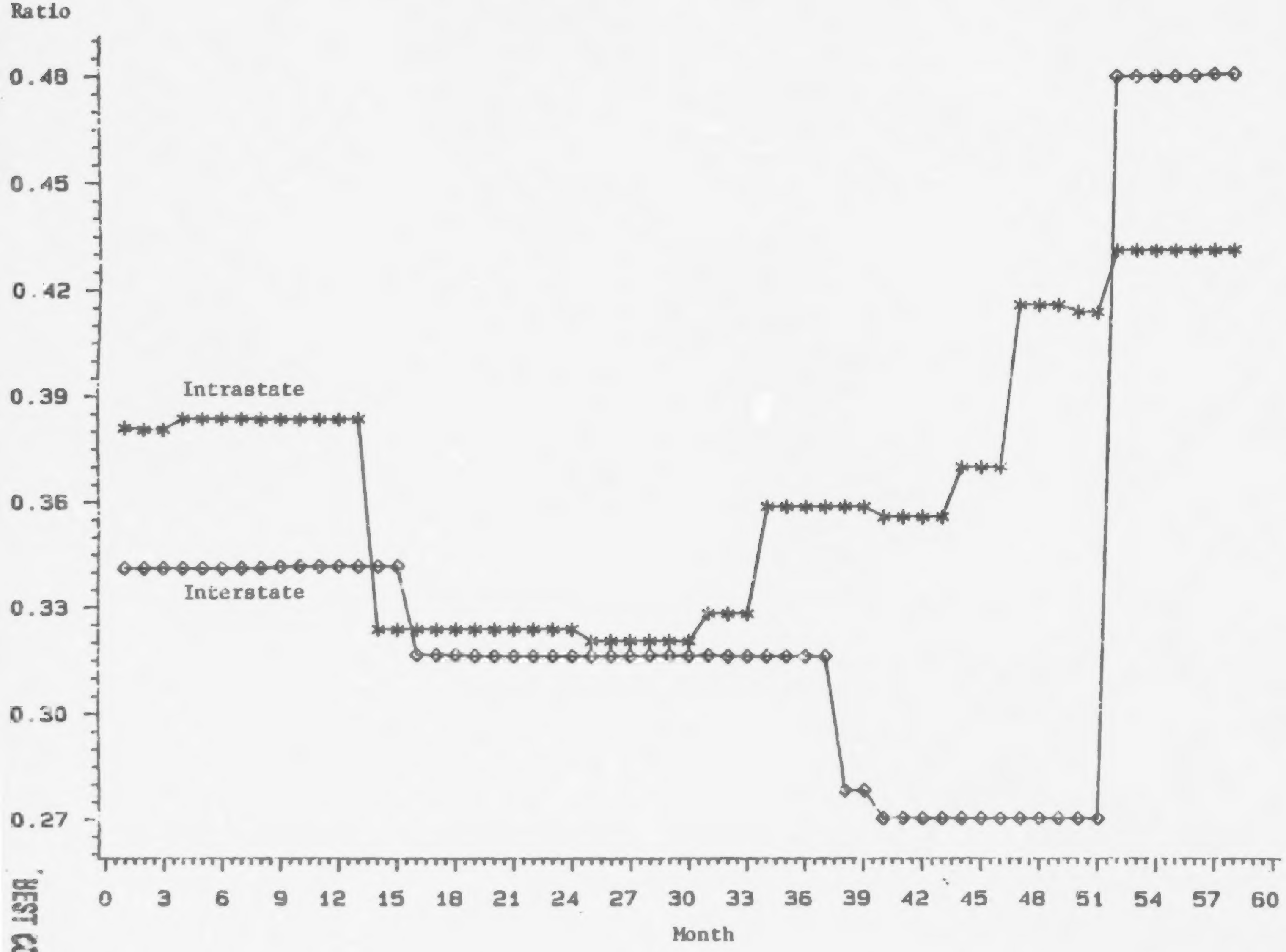

Figure 3.8 Ratio of commodity class 100 freight rates for shipment weight categories over 10,000 pounds and under 1,000 pounds, Arizona Route 8, January 1980-October 1984.

NOTE: Month 1 = January 1980.

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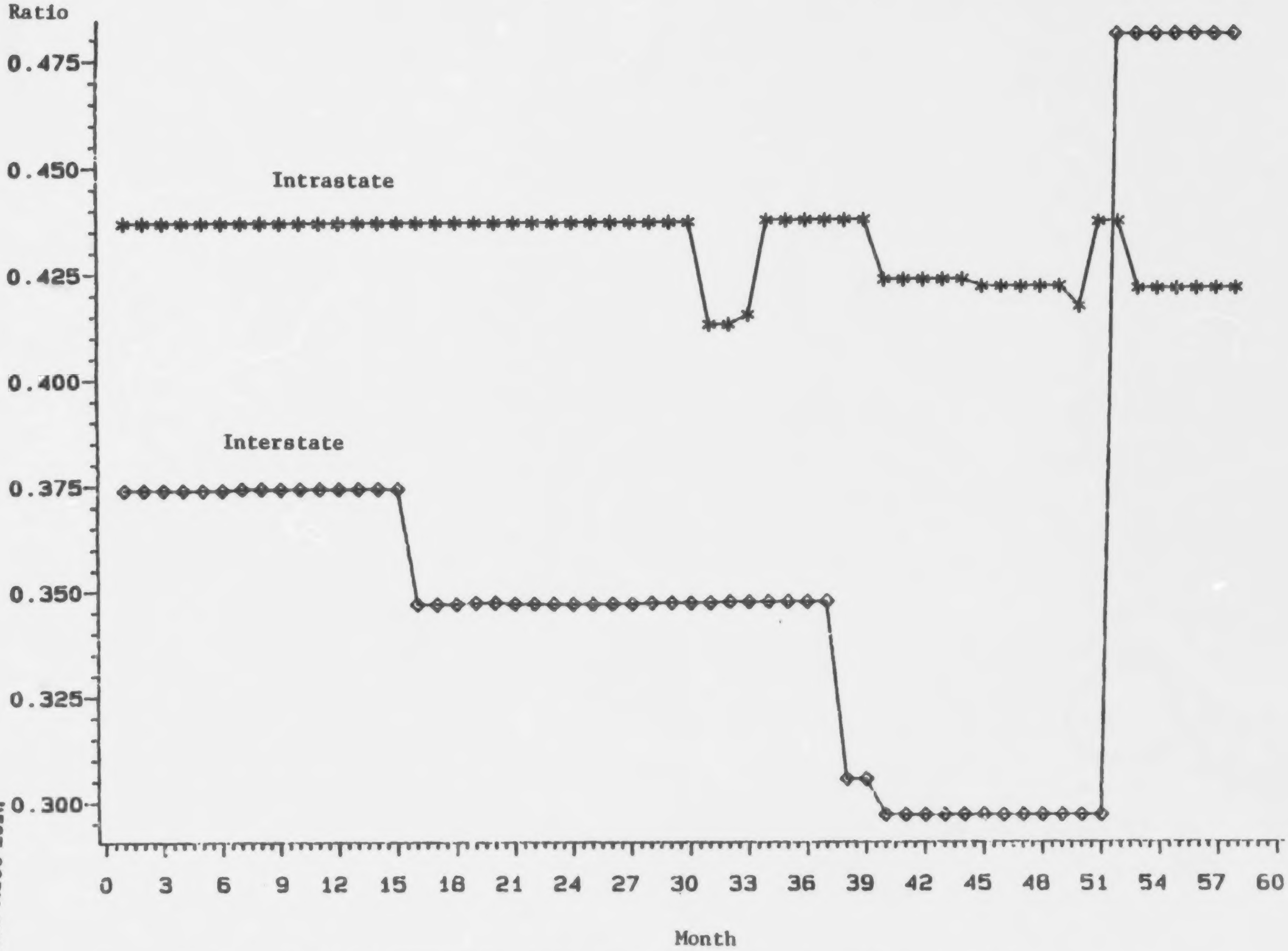

Figure 3.9 Ratio of commodity class 100 freight rates for shipment weight categories over 10,000 pounds and under 1,000 pounds, Arizona Route 9, January 1980-October 1984.

NOTE: Month 1 = January 1980.

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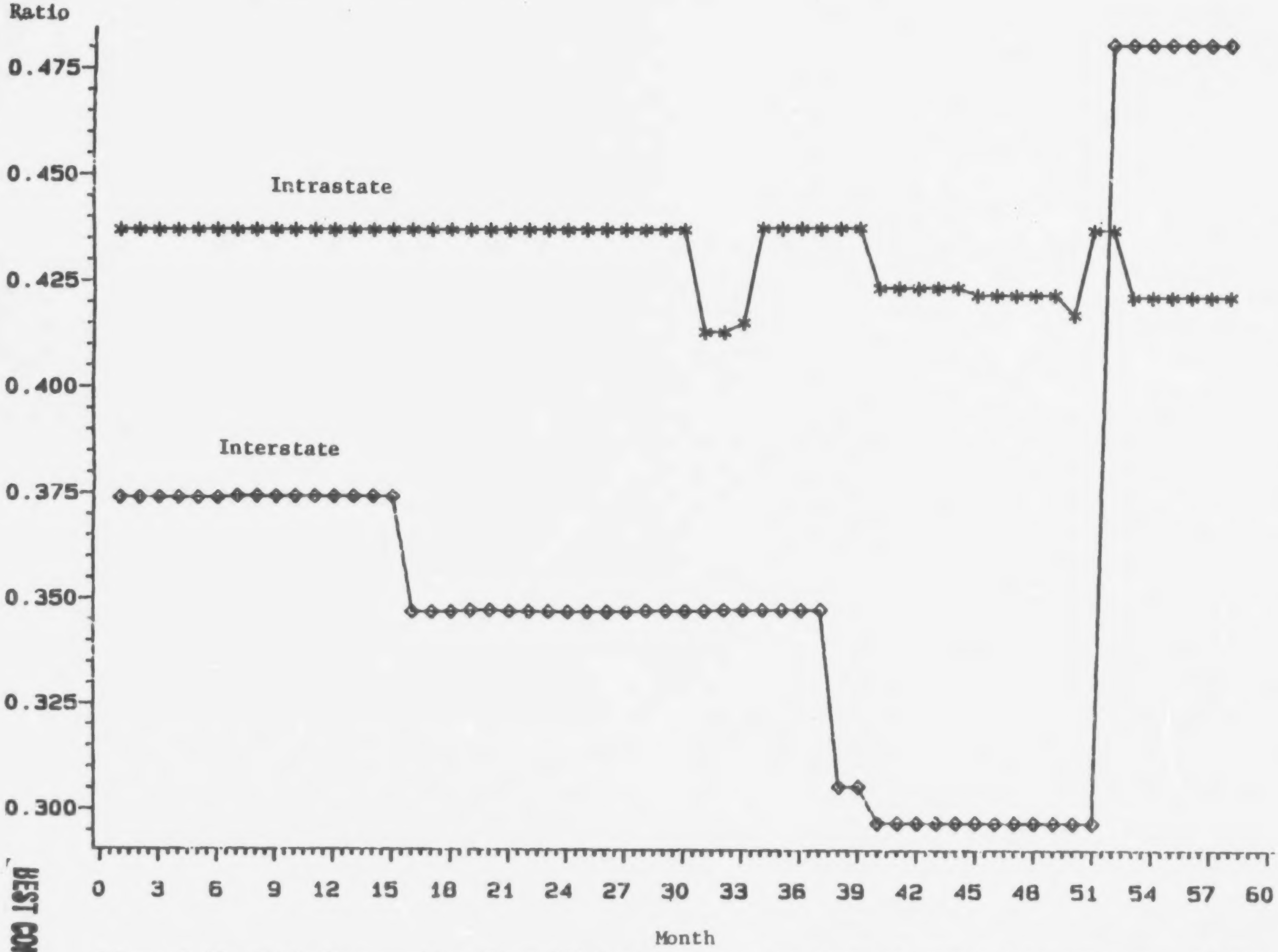

Figure 3.10 Ratio fo commodity class 100 freight rates for shipment weight categories over 10,000 pounds and under 1,000 pounds, Arizona Route 10, January 1980-October 1984.

NOTE: Month 1 = January 1980

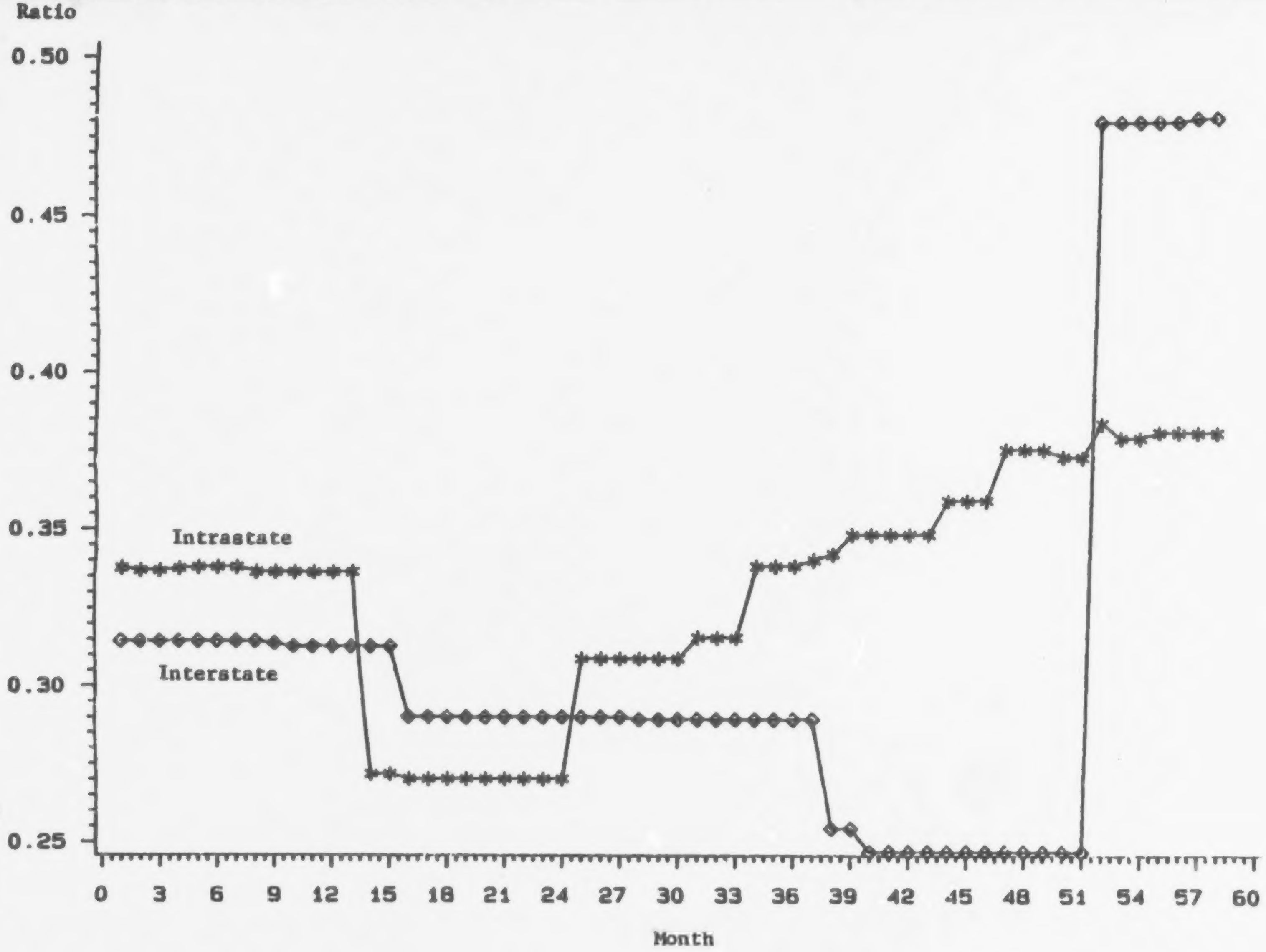

Figure 3.11 Ratio of commodity class 100 freight rates for shipment weight categories over 10,000 pounds and under 1,000 pounds, Arizona Route 11, January 1980-October 1984.

NOTE: Month 1 = January 1980

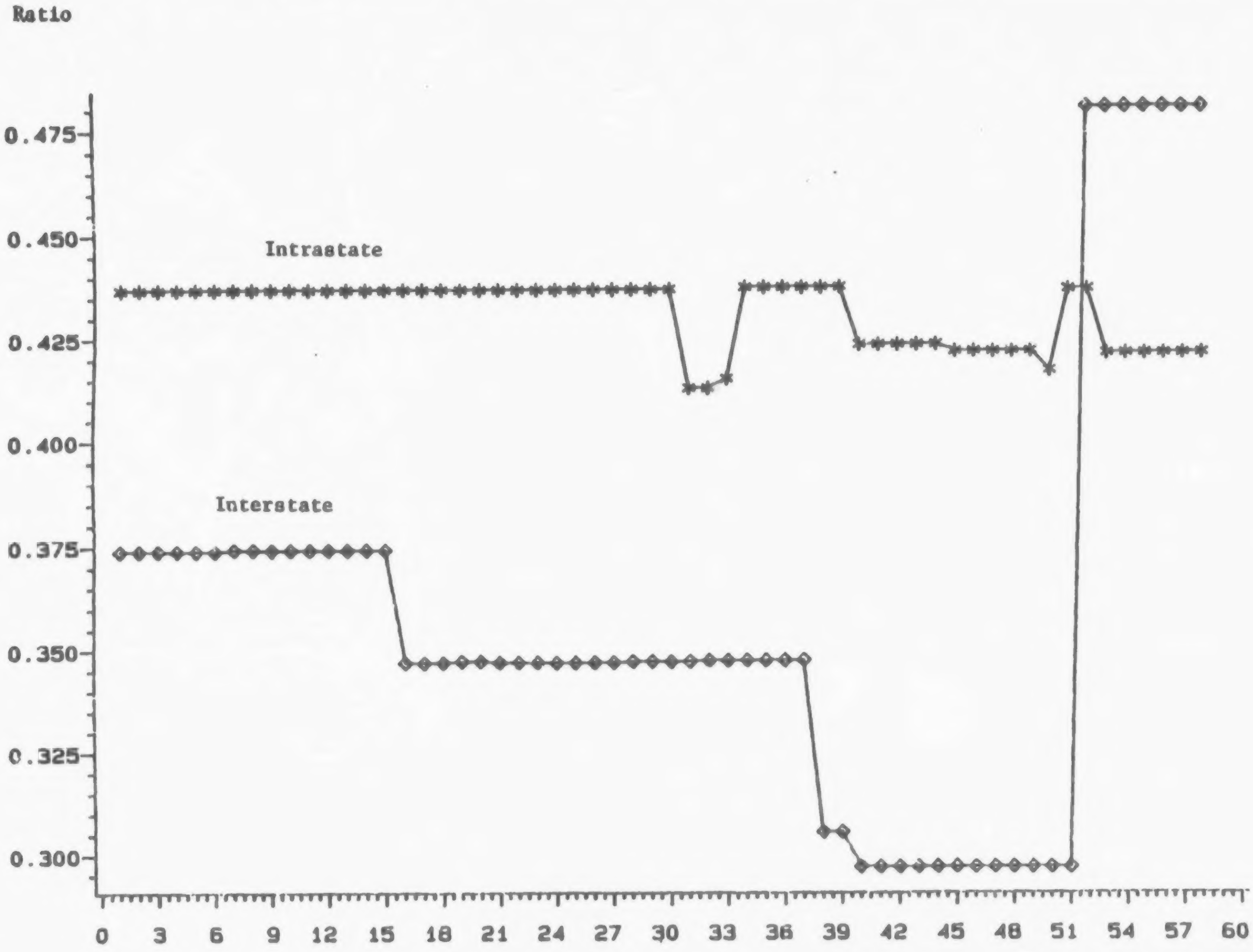

Figure 3.12 Ratio of commodity class 100 freight rates for shipment weight categories over 10,000 pounds and under 1,000 pounds, Arizona Route 12, January 1980-October 1984.

NOTE: Month 1 = January 1980

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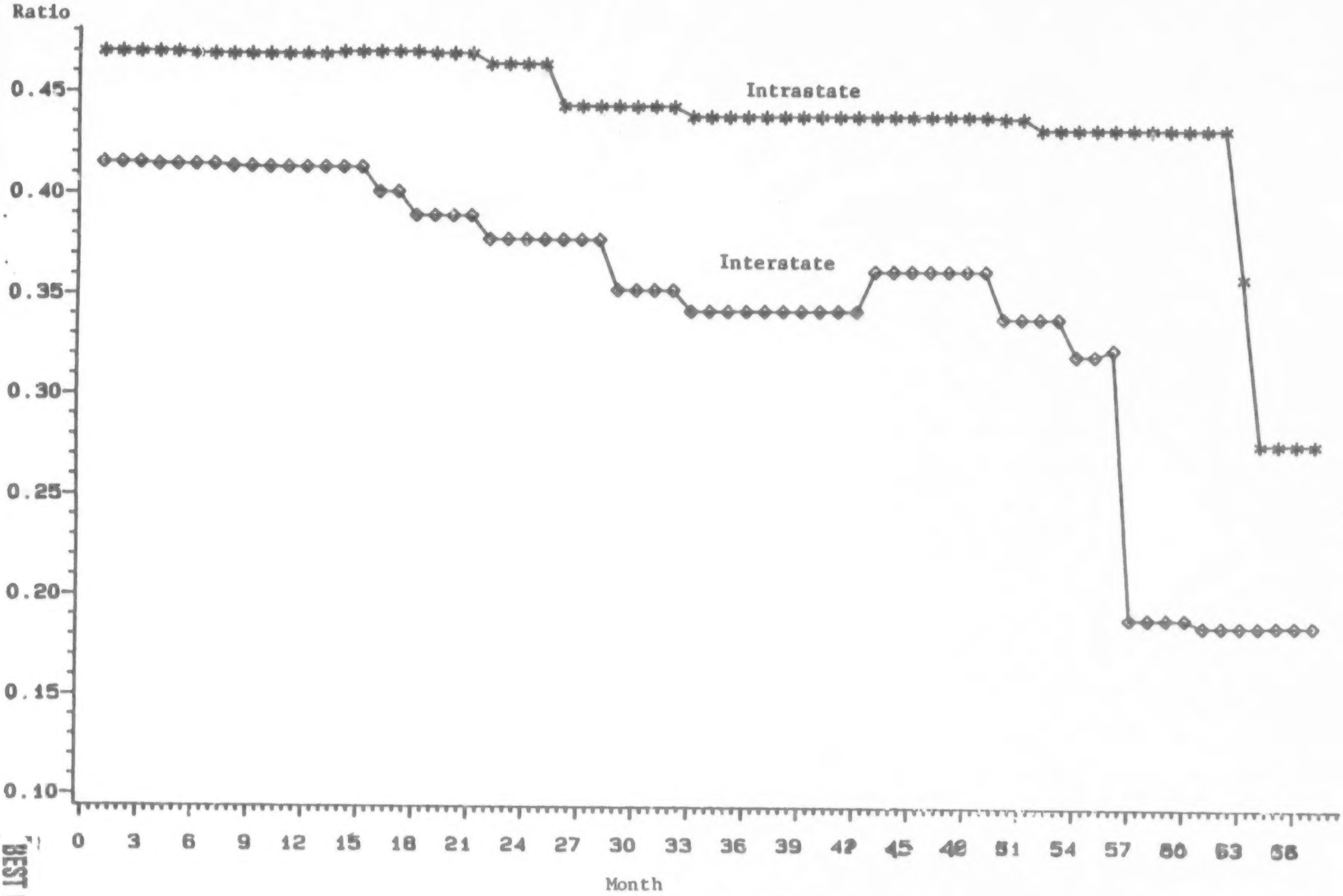

Figure 3.13 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 1 , January 1979-October 1984.

NOTE: Month 1 = January 1979

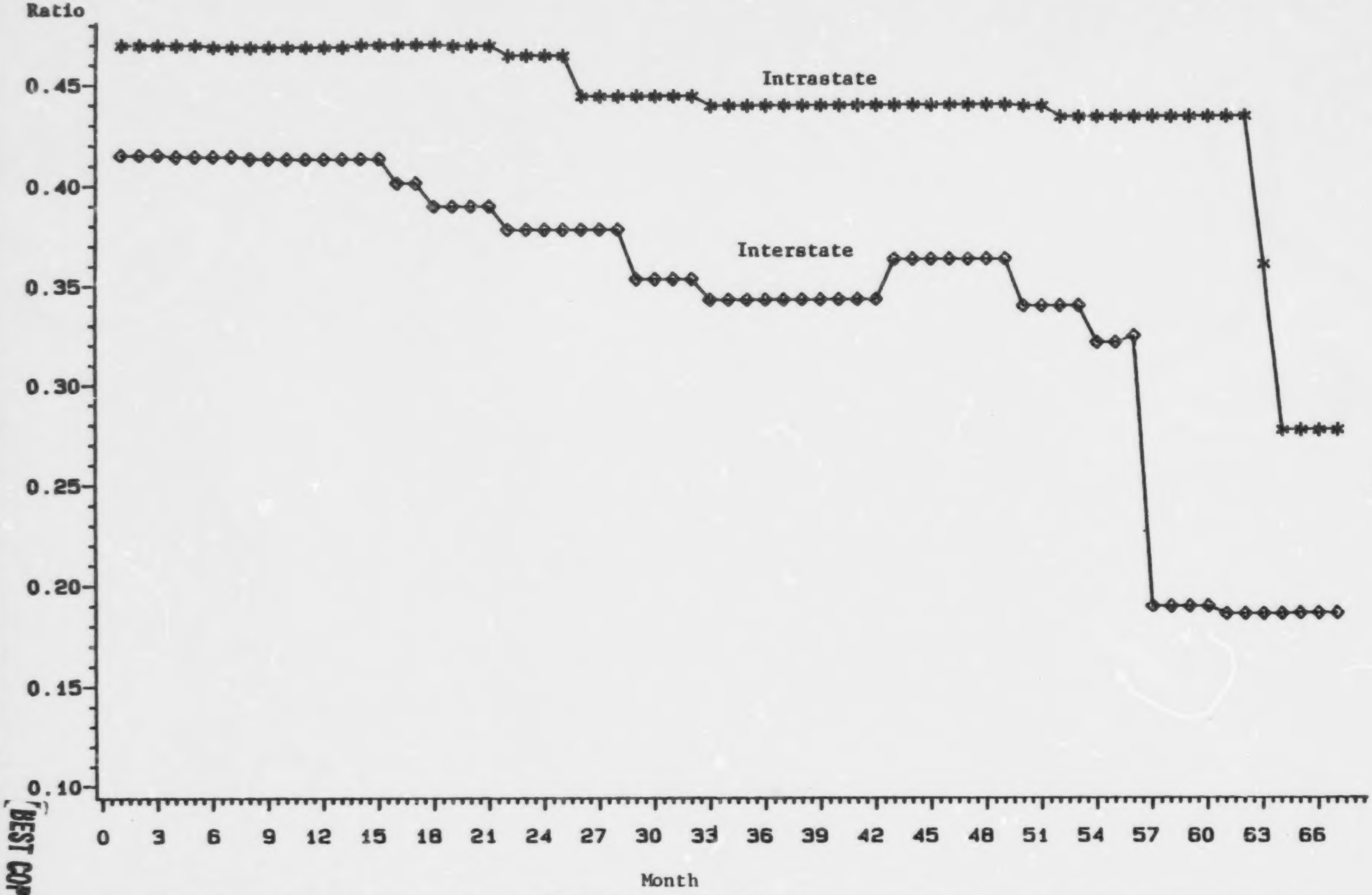

Figure 3.14 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 2, January 1979-October 1984.

NOTE: Month 1 = January 1979

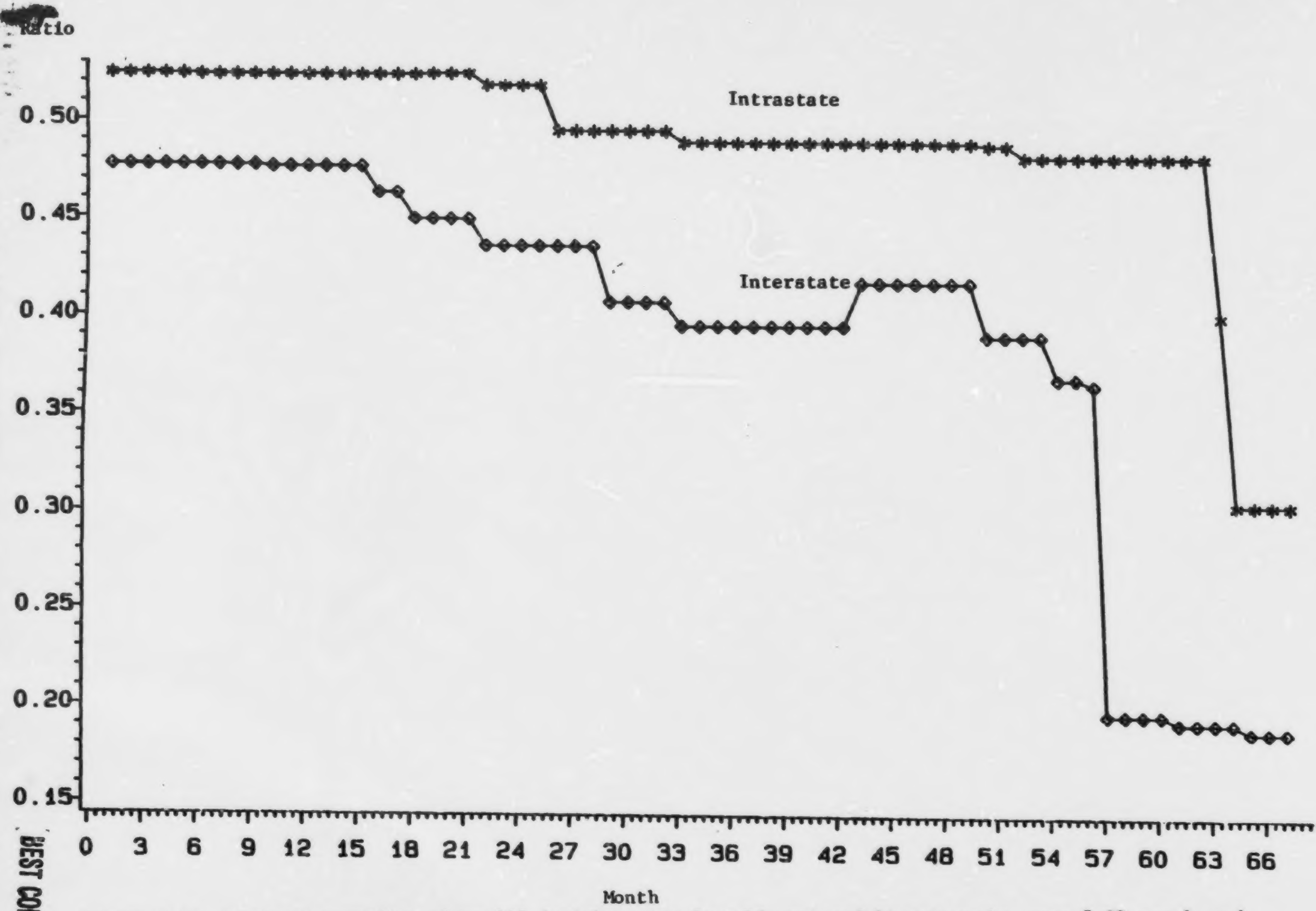

Figure 3.15 Ratio of commodity class 125 freight rates for shipment weight categories over 5,00 pounds and under 500 pounds, Florida Route 3, January 1979-October 1984.

NOTE: Month 1 = January 1979

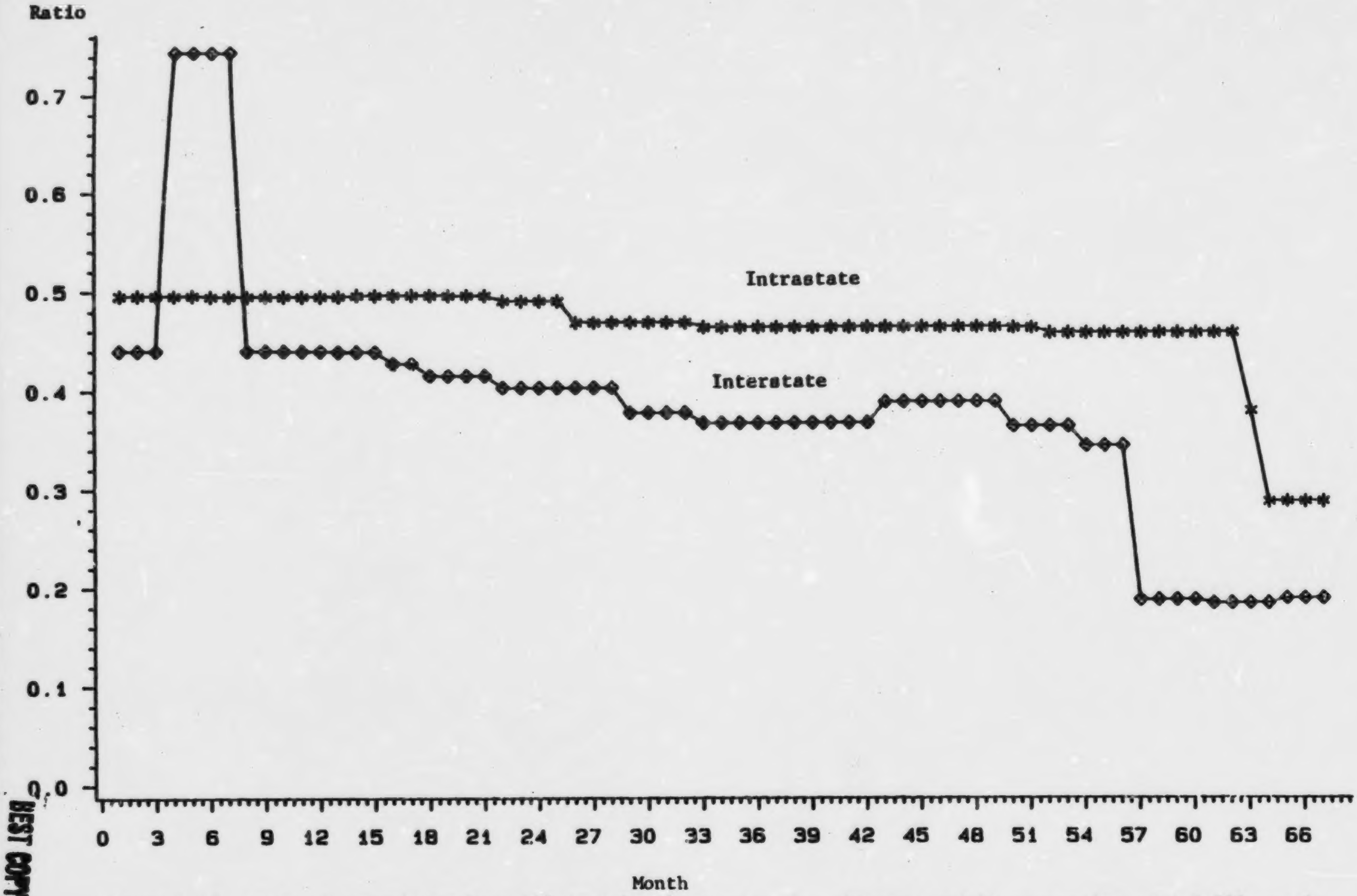

Figure 3.16 Ratio of commodity class 125 freight class rates for shipment weight cagegories over 5,000 pounds and under 500 pounds, Florida Route 4, January 1979-October 1984.

NOTE: Month 1 = January 1979

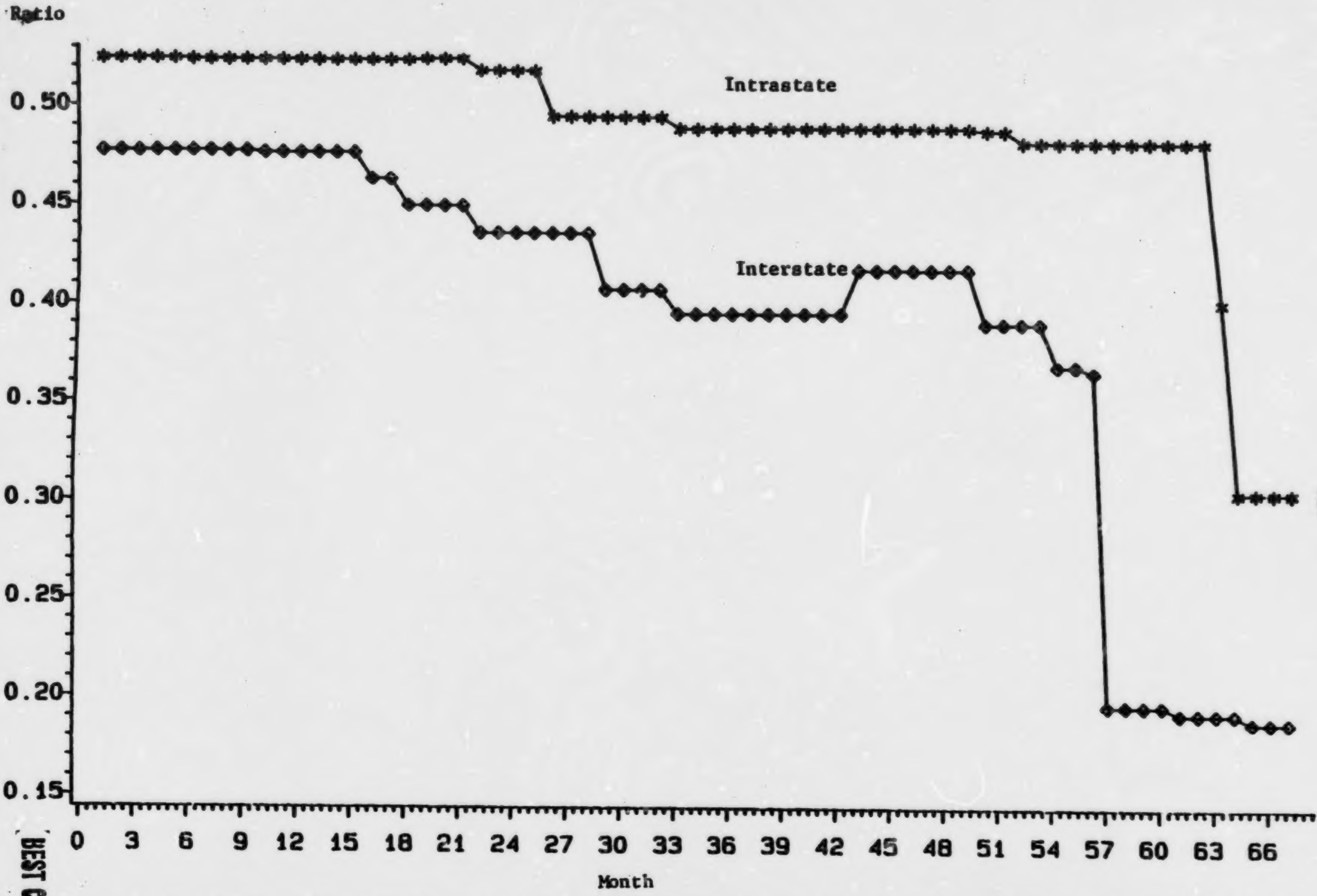

Figure 3.17 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Floria Route 5, January 1979-October 1984.

NOTE: Month 1 = January 1979.

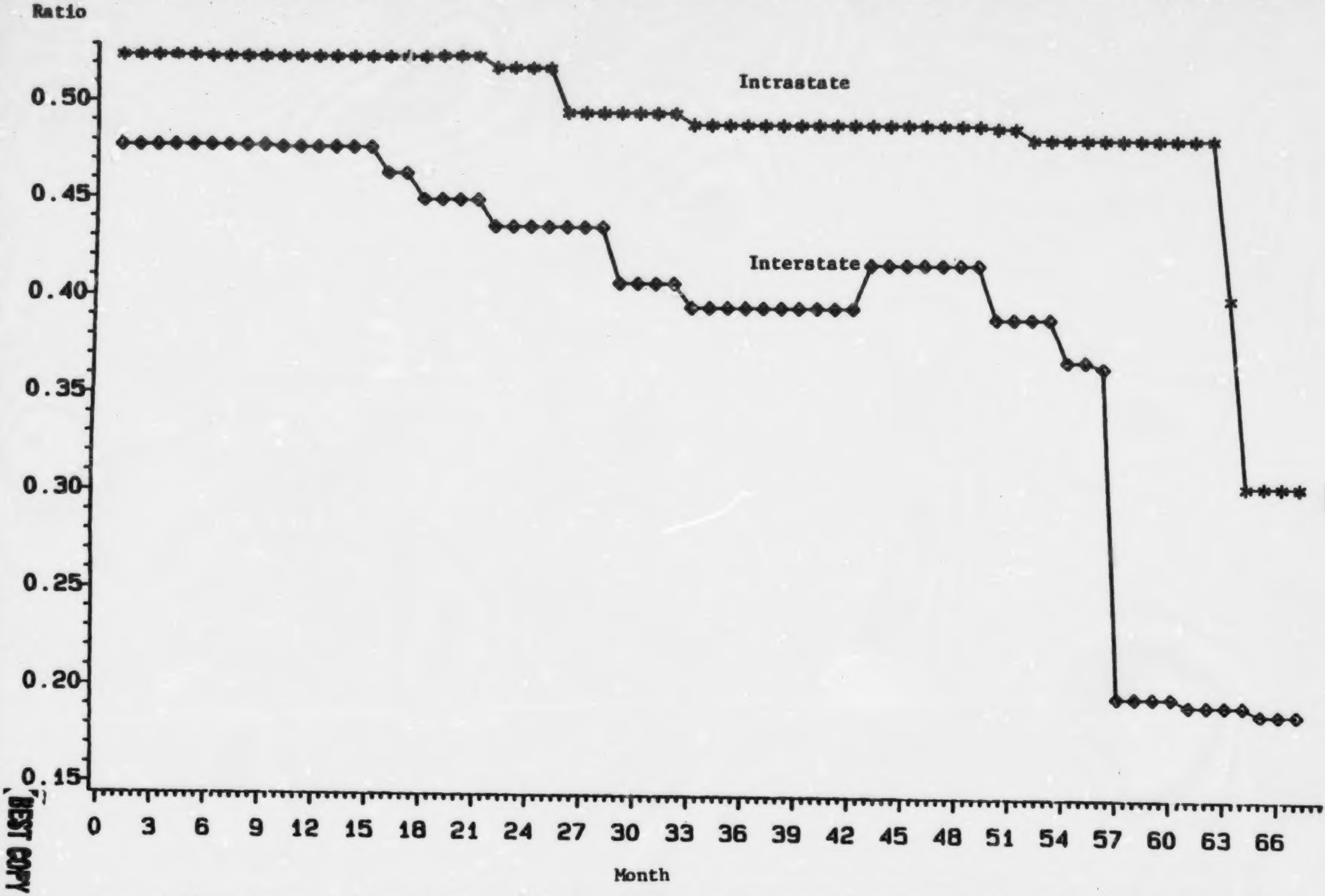

Figure 3.18 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 6, January 1979-October 1984.

NOTE: Month 1 = January 1979

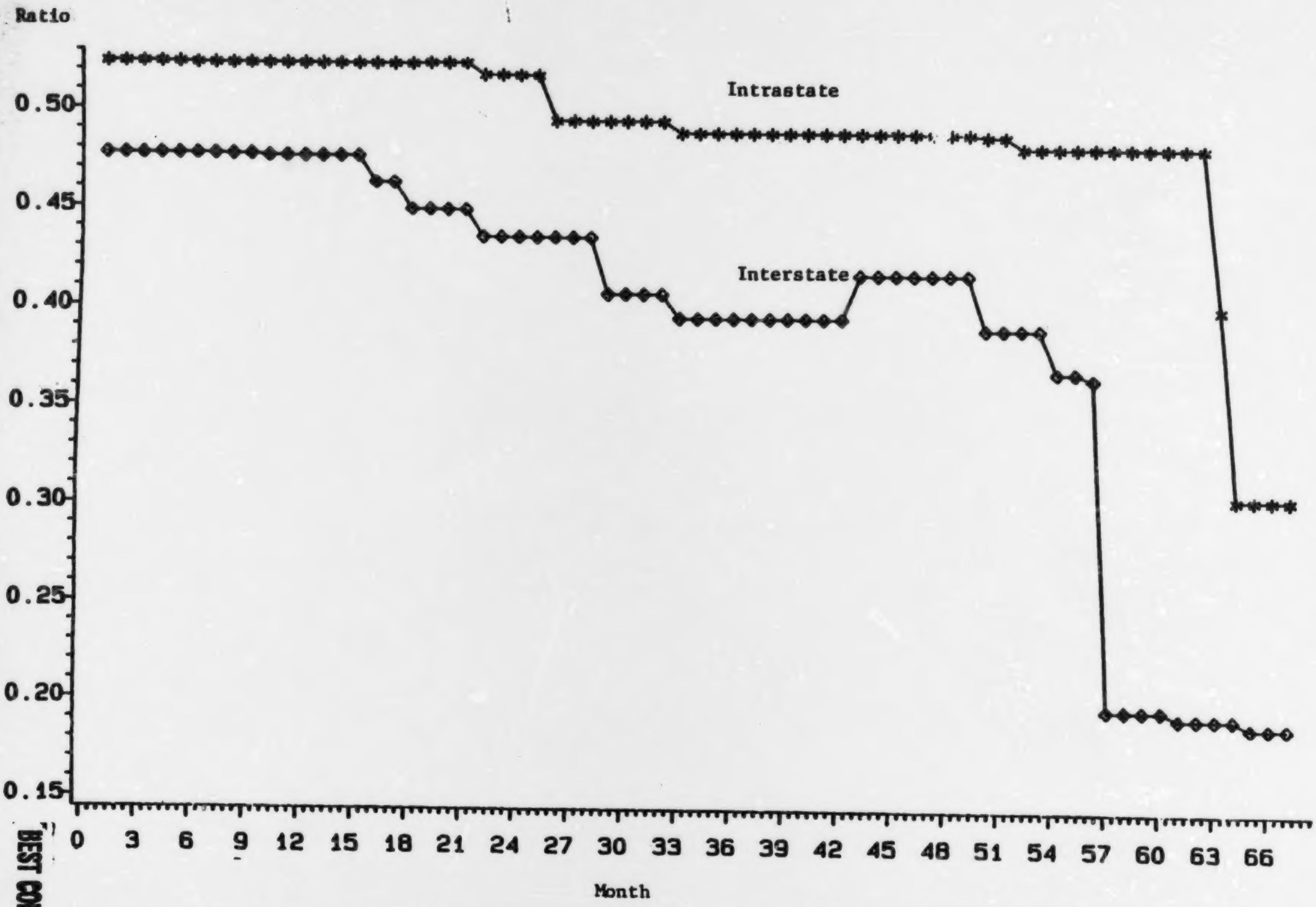

Figure 3.19 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 7, January 1979-October 1984.

NOTE: Month 1 = January 1979

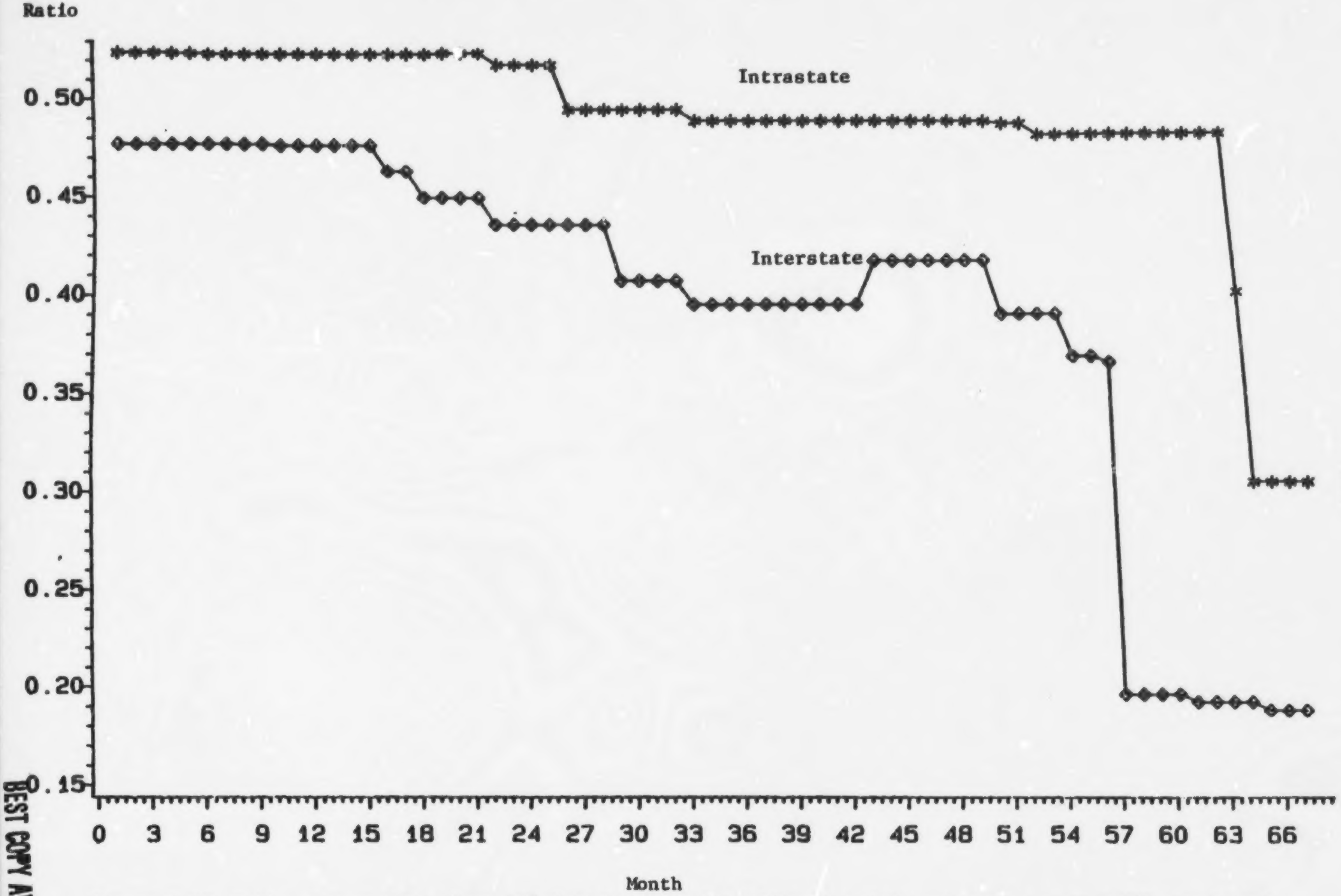

Figure 3.20 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 8, January 1979-October 1984.

NOTE: Month 1 = January 1979

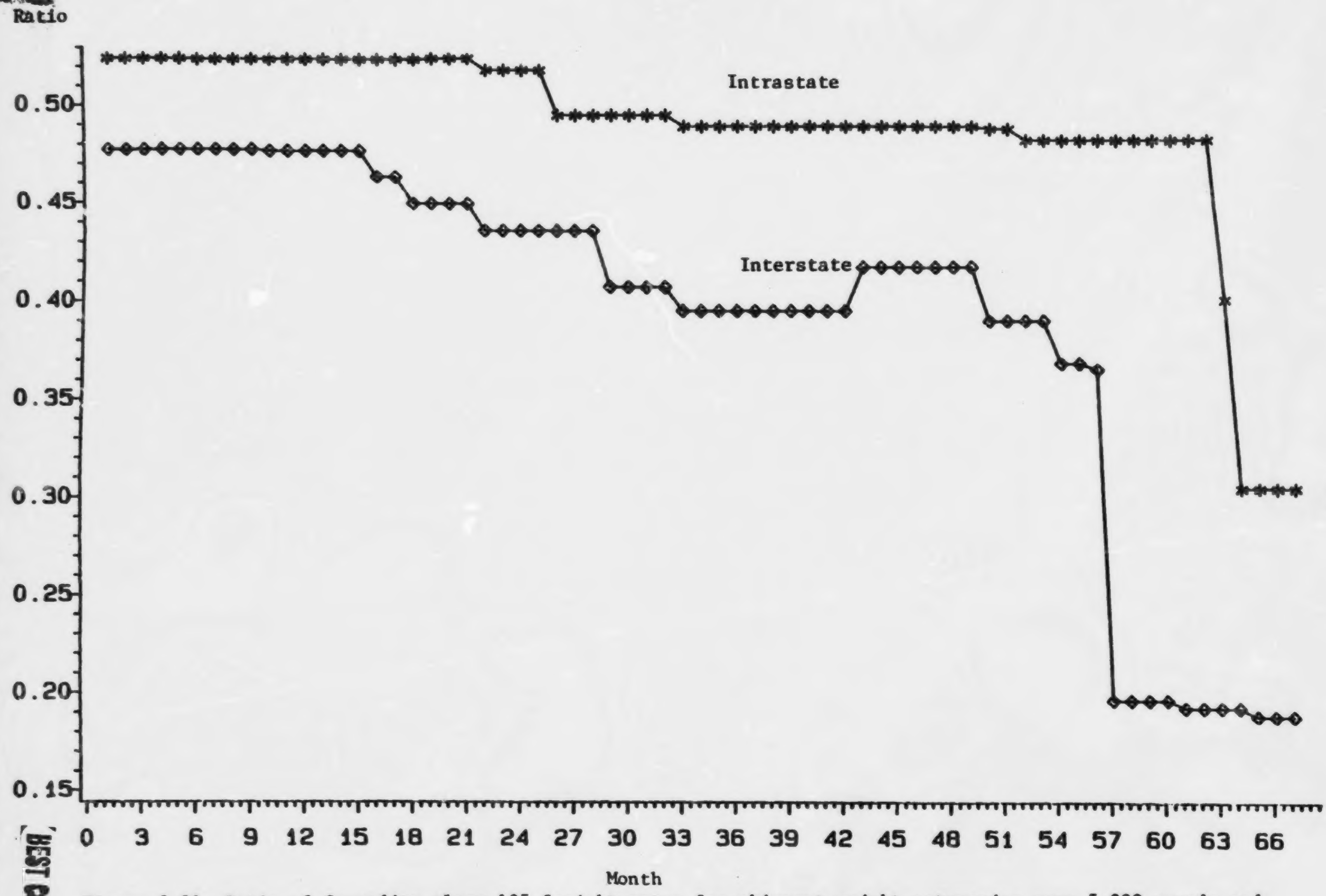

Figure 3.21 Ratio of Commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 9, January 1979-October 1984.

NOTE: Month 1 = January 1979

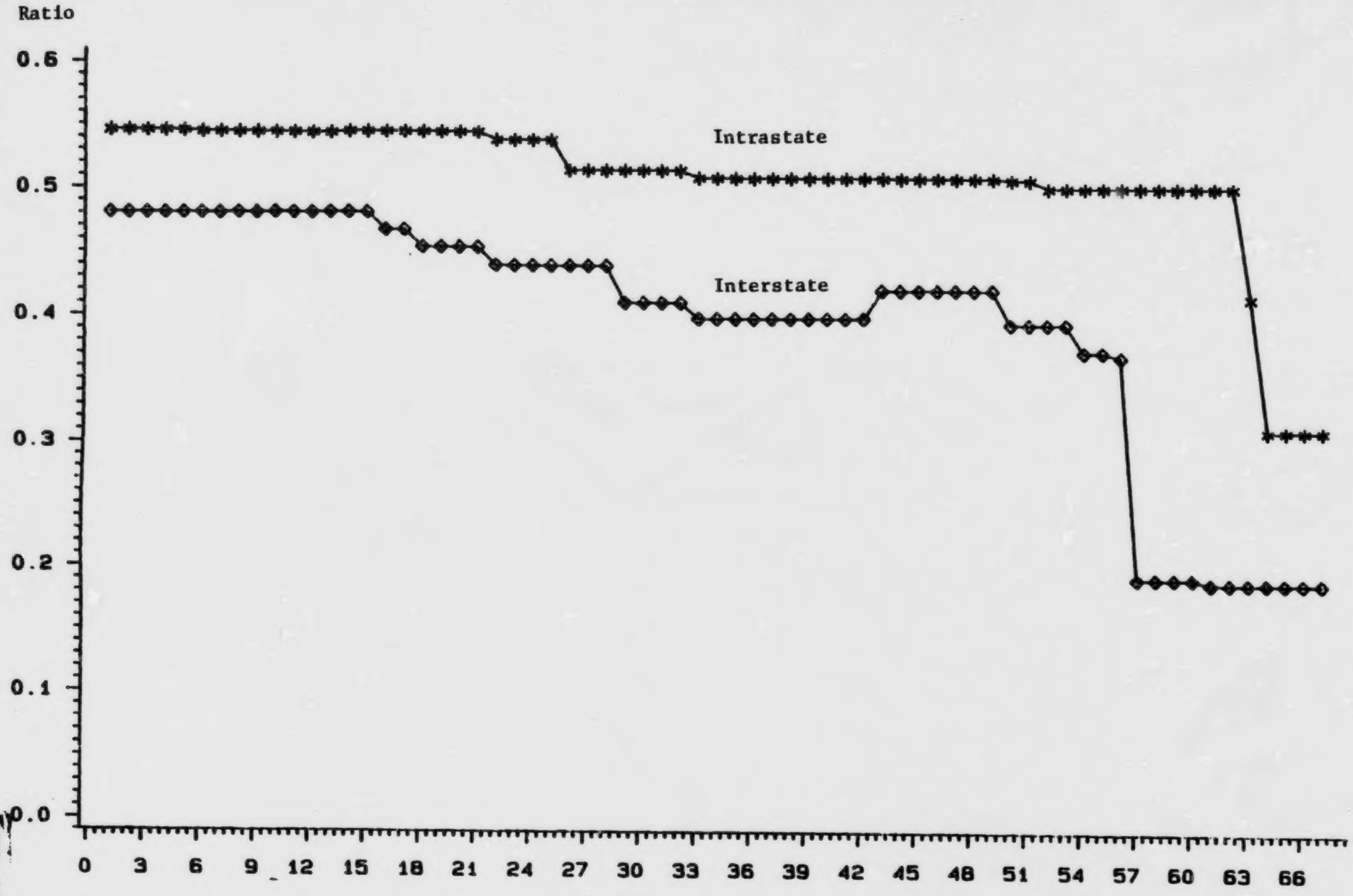

Figure 3.22 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 10, January 1979-October 1984.

NOTE: Month 1 = January 1979

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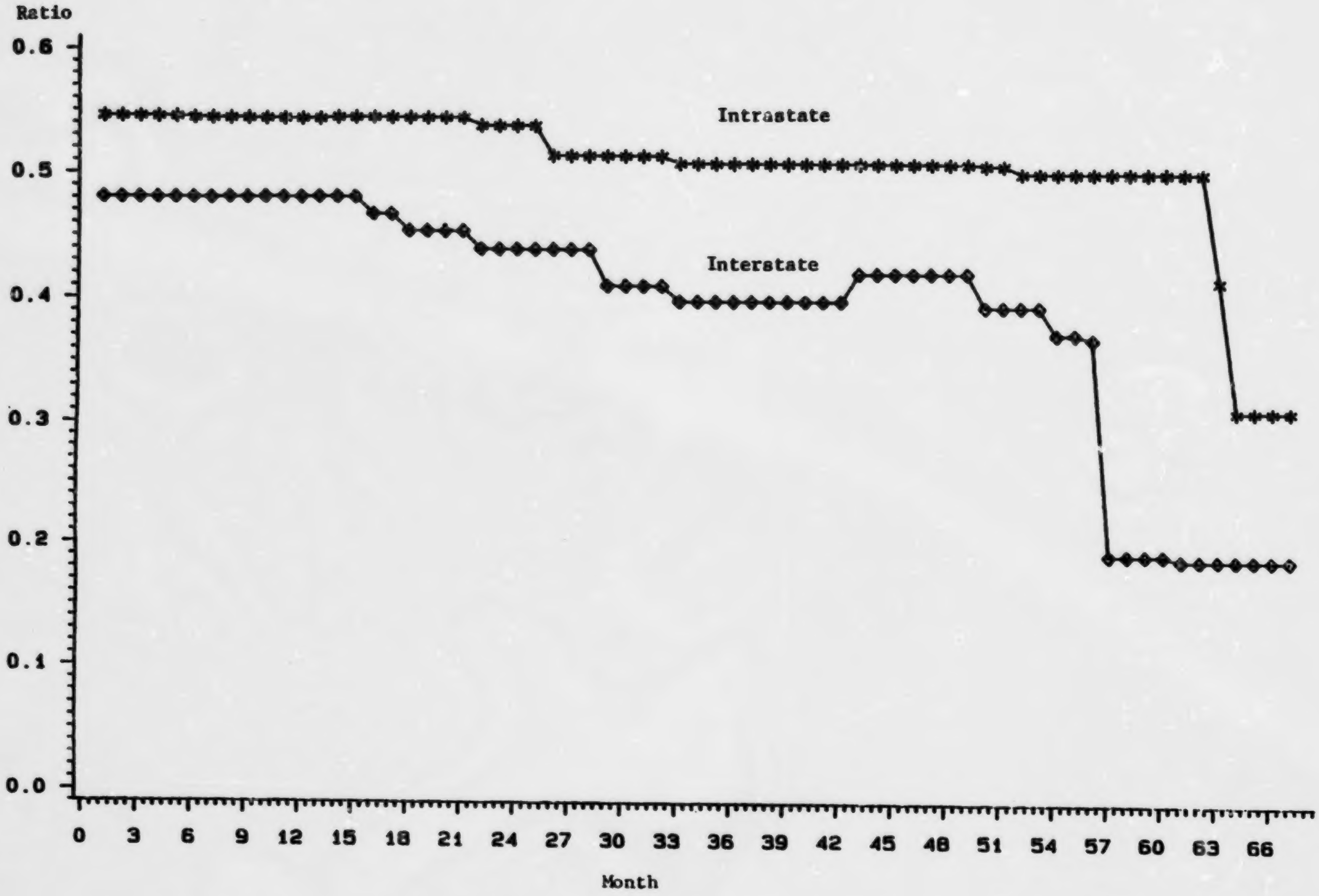

Figure 3.23 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 11, Januay 1979-October 1984.

NOTE: Month 1 = January 1979

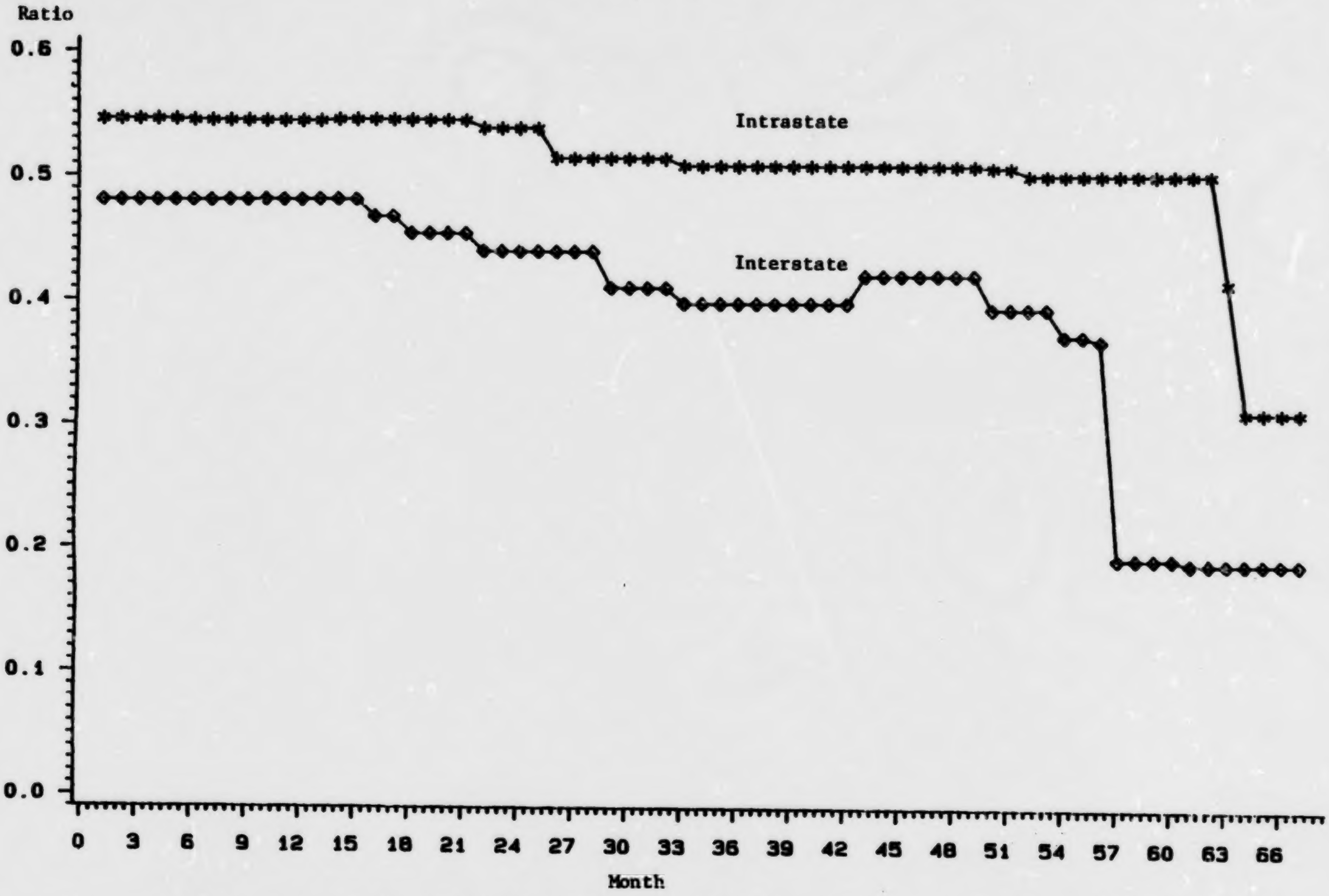

Figure 3.24 Raito of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 12, Januay 1979-October 1984.

NOTE: Month 1 = January 1979

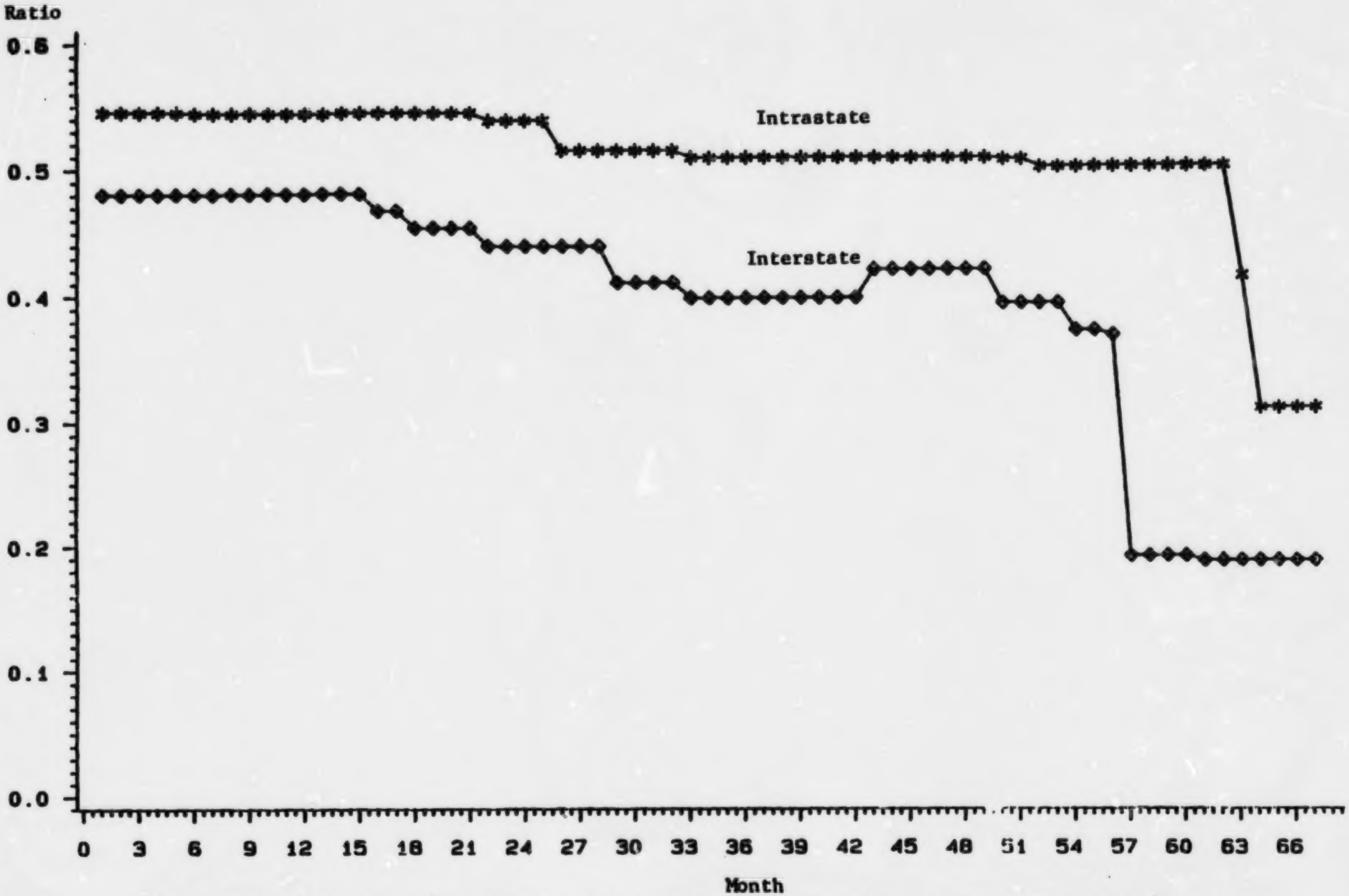

Figure 3.25 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 13, January 1979–October 1984.

NOTE: Month 1 = January 1979

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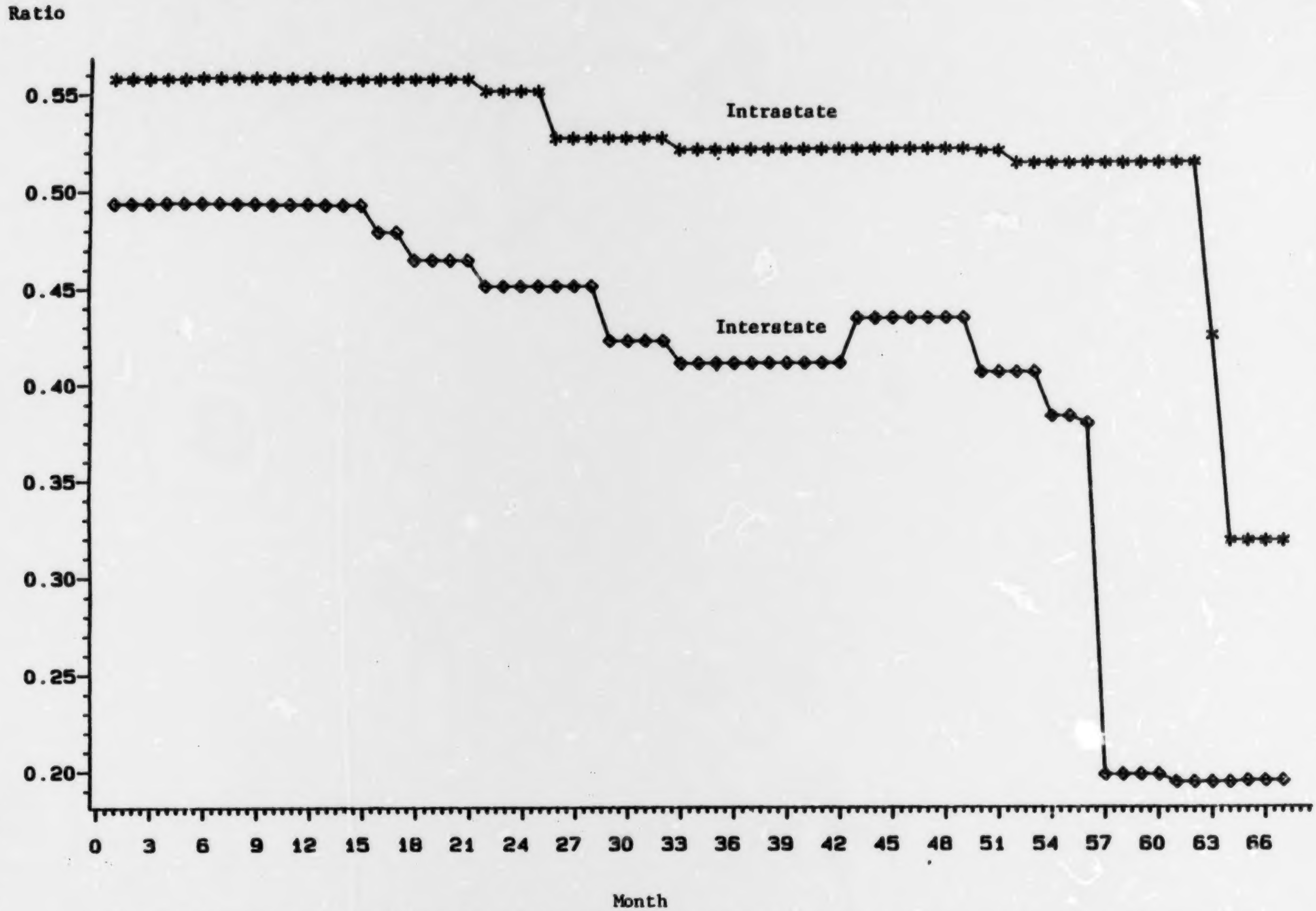

Figure 3.26 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 14, January 1979-October 1984.

NOTE: Month 1 = January 1979

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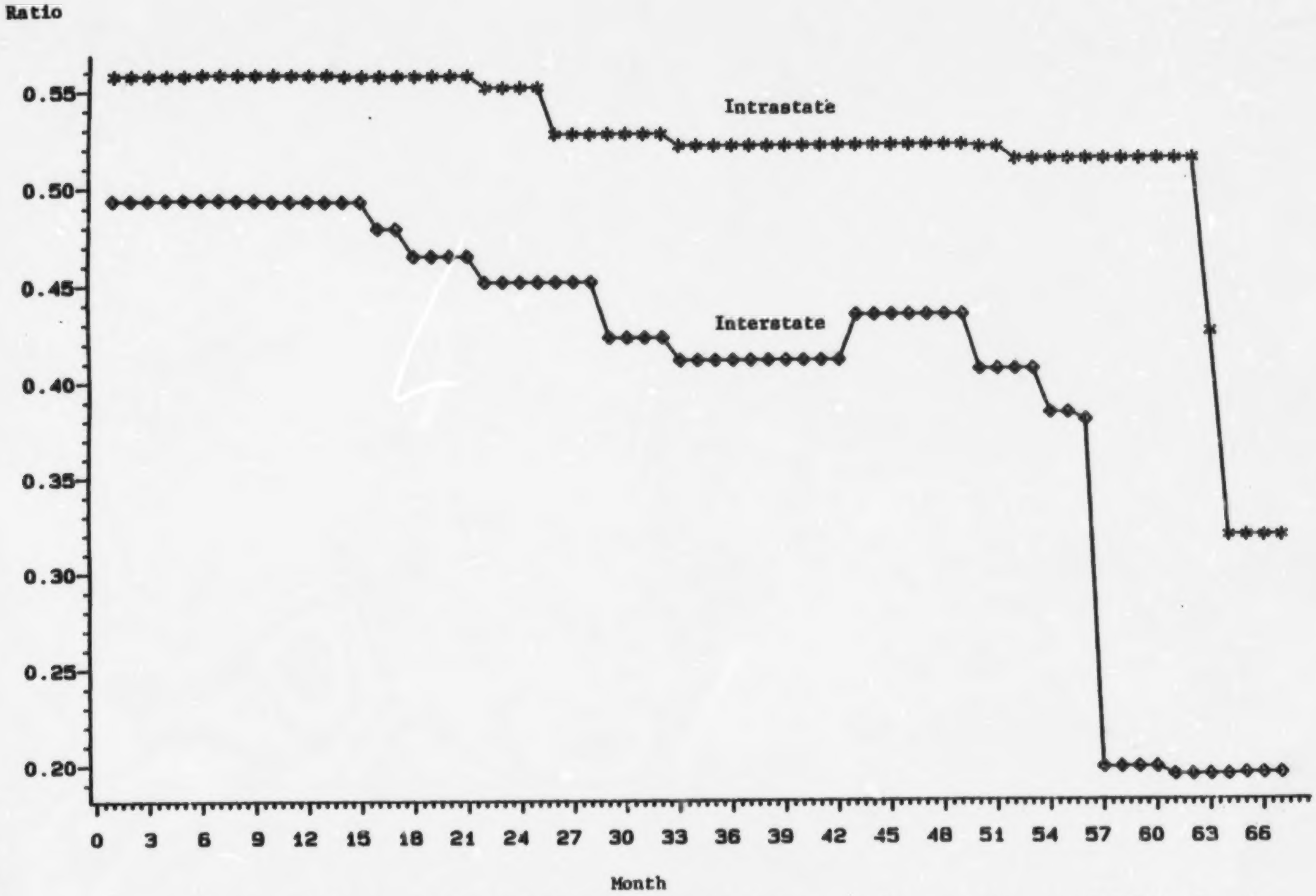

Figure 3.27 Ratio of commodity class 125 freight rates for shipment wieght categories over 5,000 pounds and under 500 pounds, Florida Route 15, January 1979-October 1984.

NOTE: Month 1 = January 1979

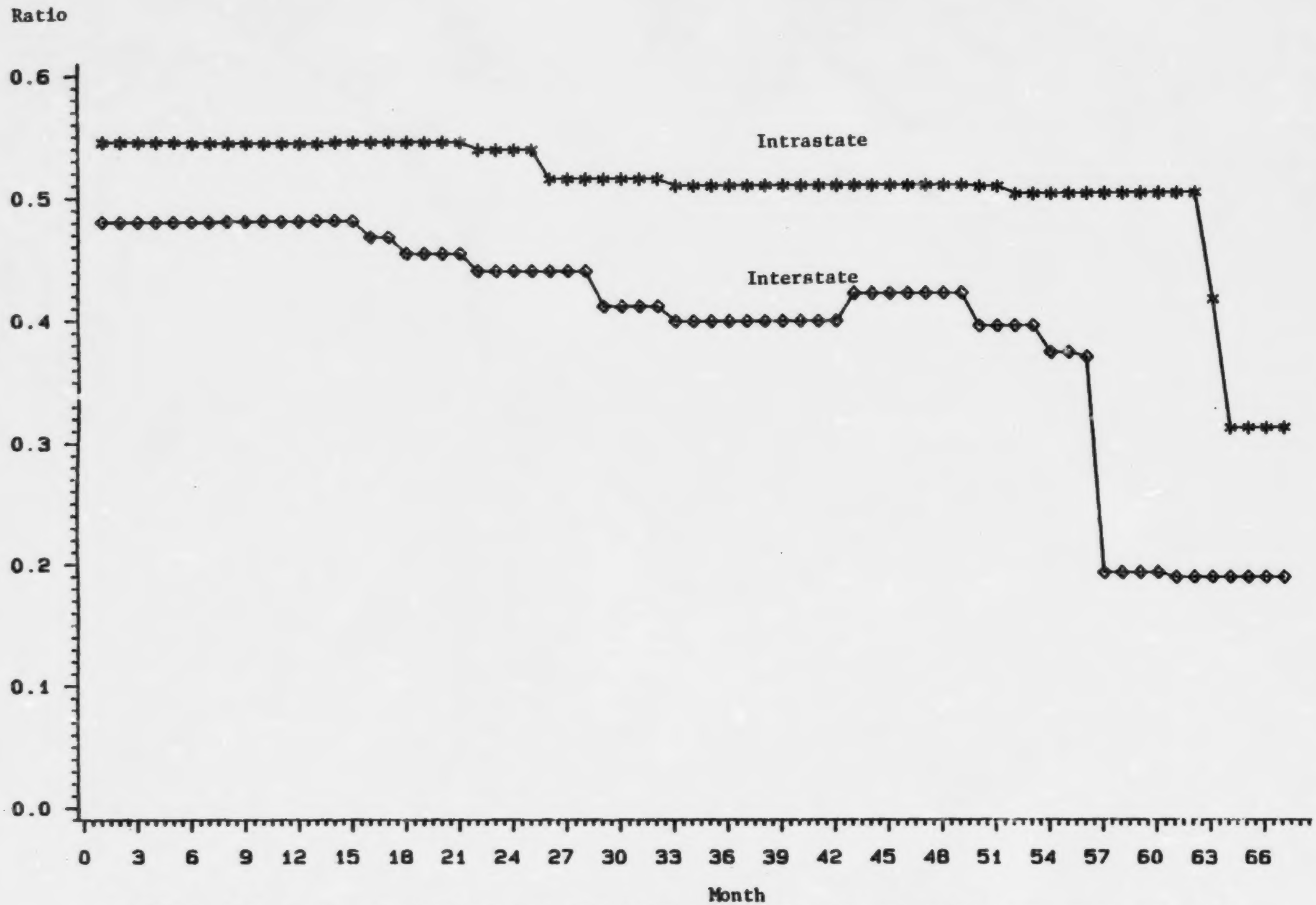

Figure 3.28 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 16, January 1979-October 1984.

NOTE: Month 1 = January 1979

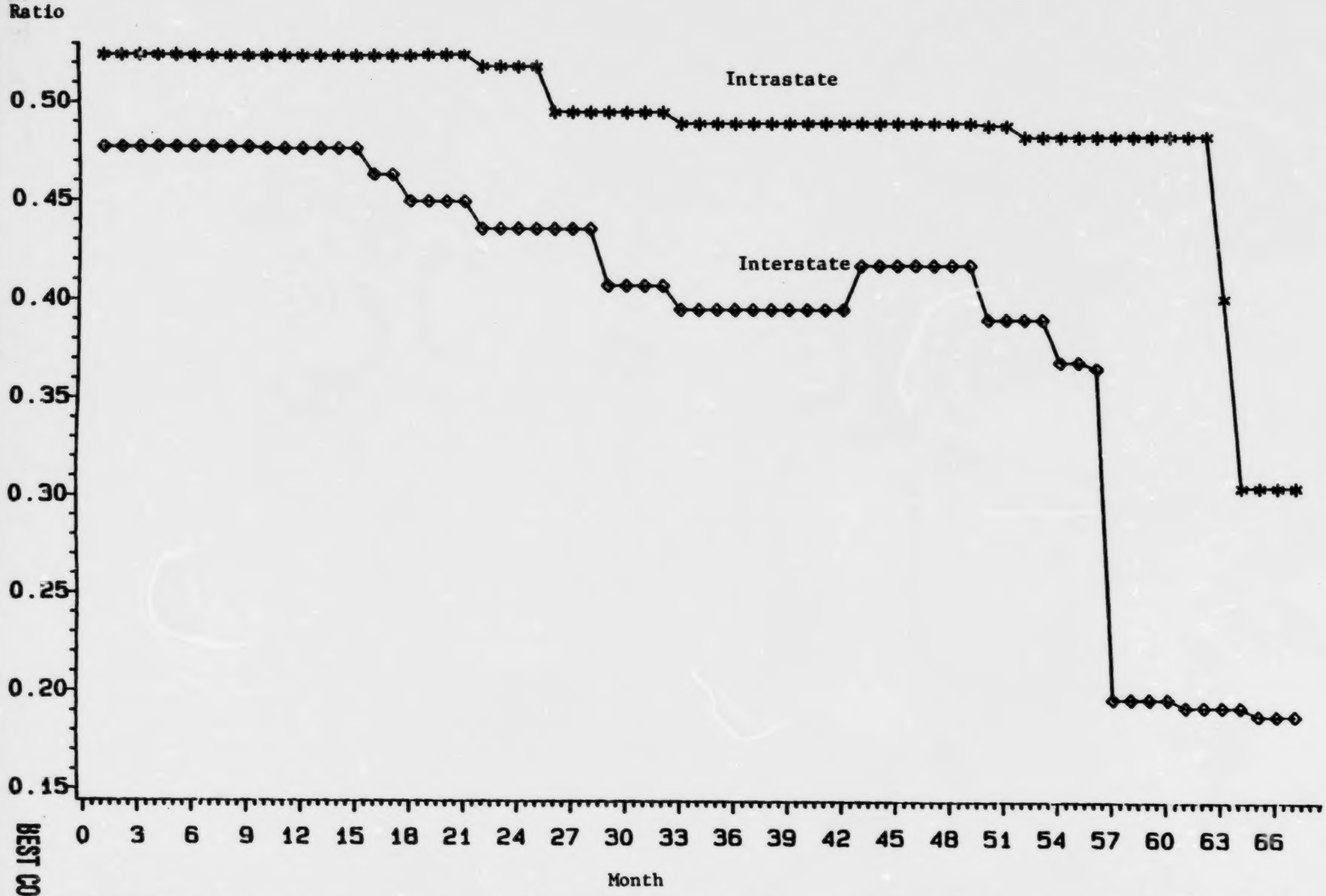

Figure 3.29 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 17, January 1979-October 1984.

NOTE: Month 1 = January 1979

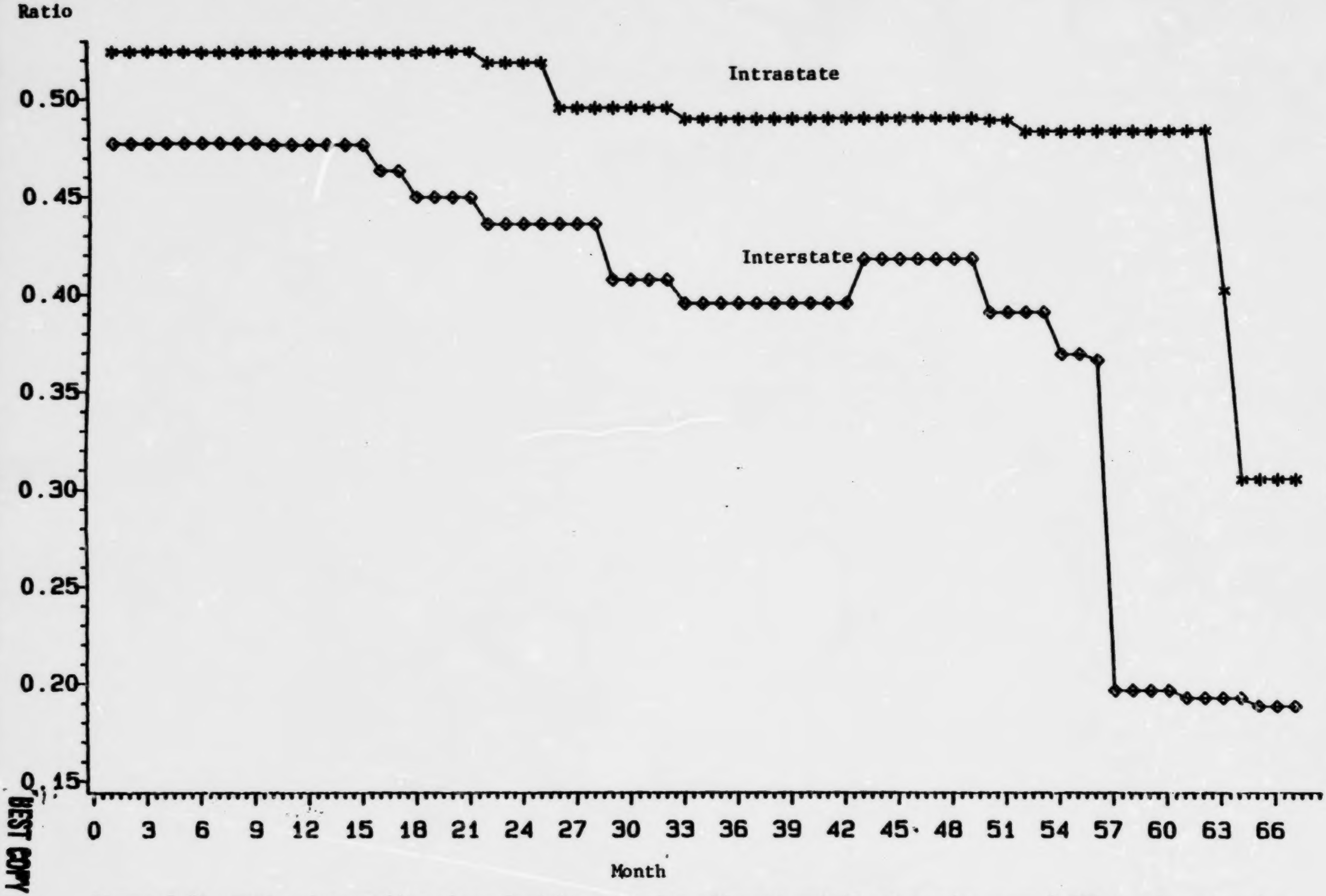

Figure 3.30 Ratio of commodity class freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 18, January 1979-October 1984.

NOTE: Month 1 = January 1979

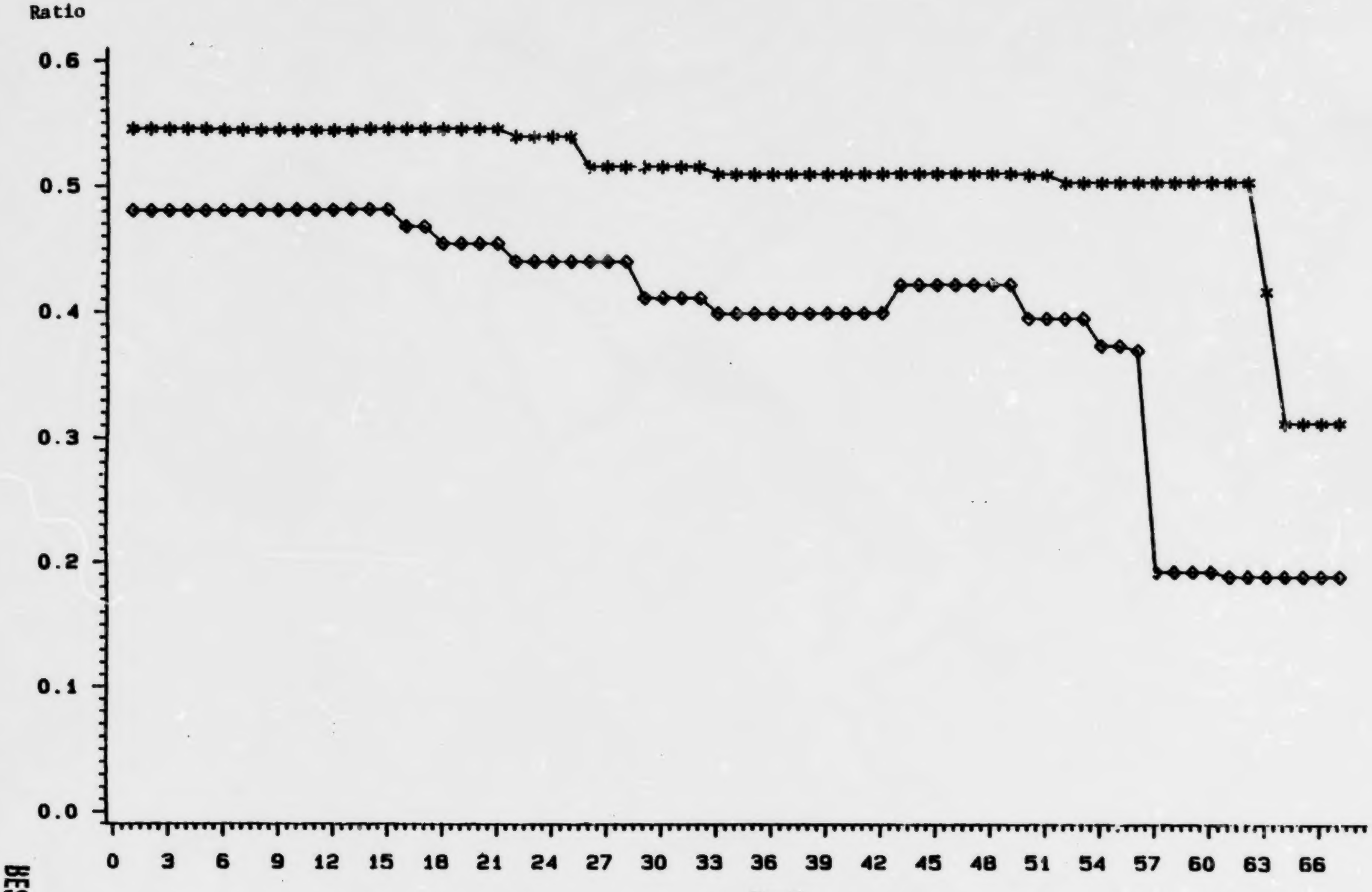

Figure 3.31 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 19, January 1979-October 1984.

NOTE: Month 1 = January 1979

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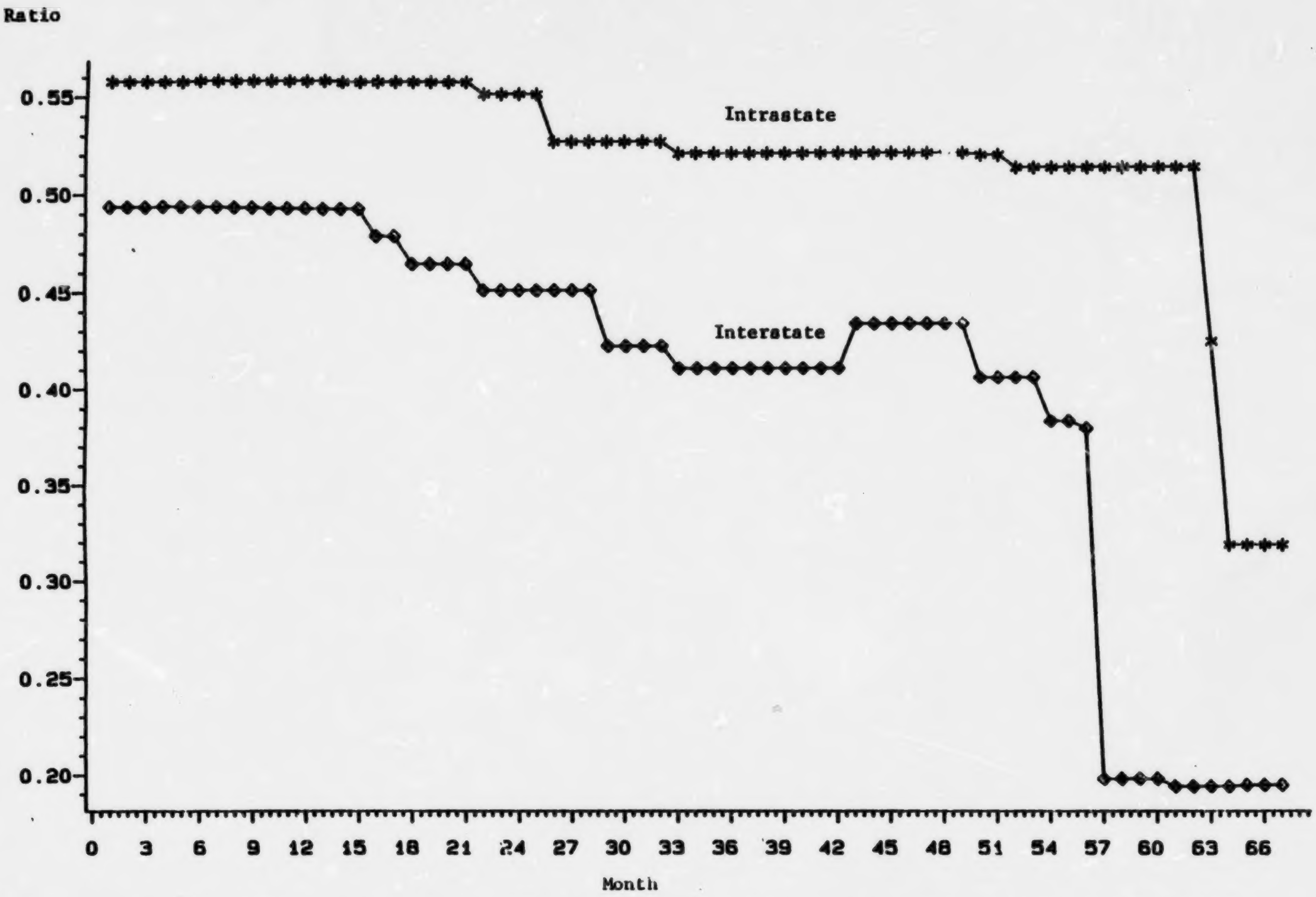

Figure 3.32 Ratio of commodity class 125 freight rates for shipment weight categories over 5,000 pounds and under 500 pounds, Florida Route 20, January 1979-October 1984.

NOTE: Month 1 = January 1979

APPENDIX 4

RATIO OF RATES FOR HIGHEST AND LOWEST COMMODITY CLASSIFICATIONS

ARIZONA

JANUARY 1980 - OCTOBER 1984

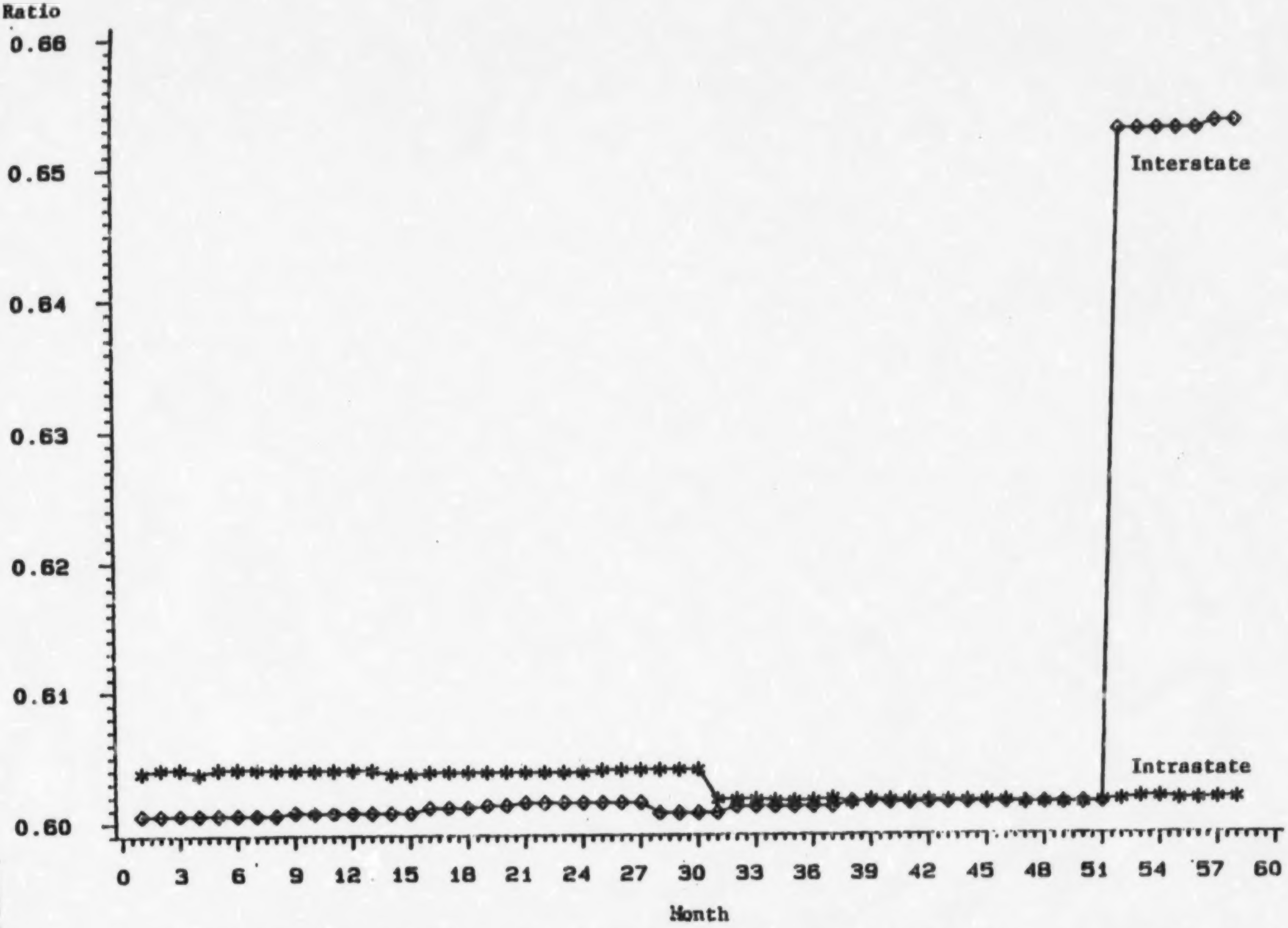

Figure 4.1 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100 Arizona Route 1, January 1980-October 1984.

NOTE: Month 1 = January 1980

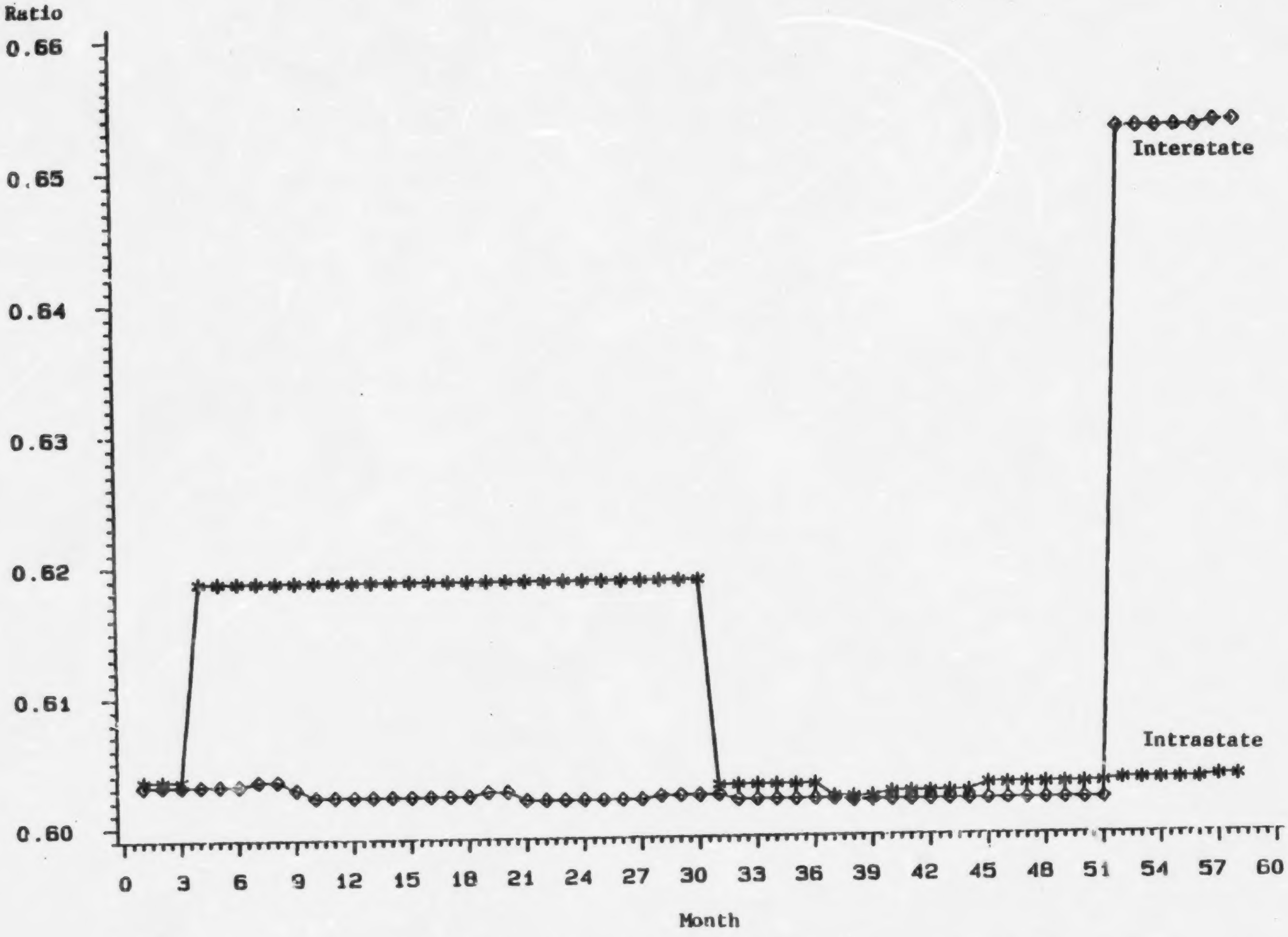

Figure 4.2 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100, Arizona Route 2, January 1980-October 1984.

NOTE: Month 1 = January 1980.

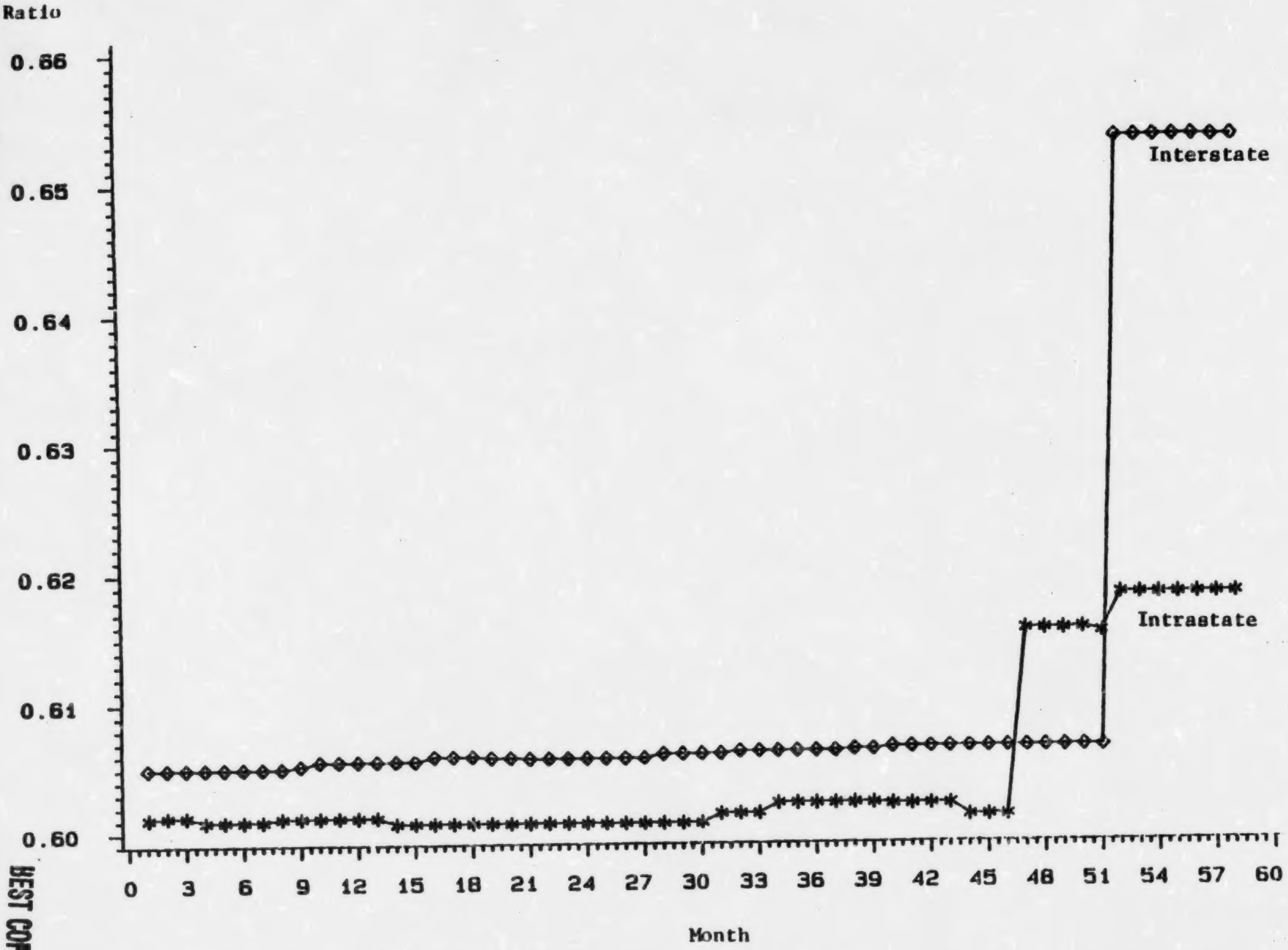

Figure 4.3 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100, Arizona Route 3, January 1980-October 1984.

NOTE: Month 1 = January 1980.

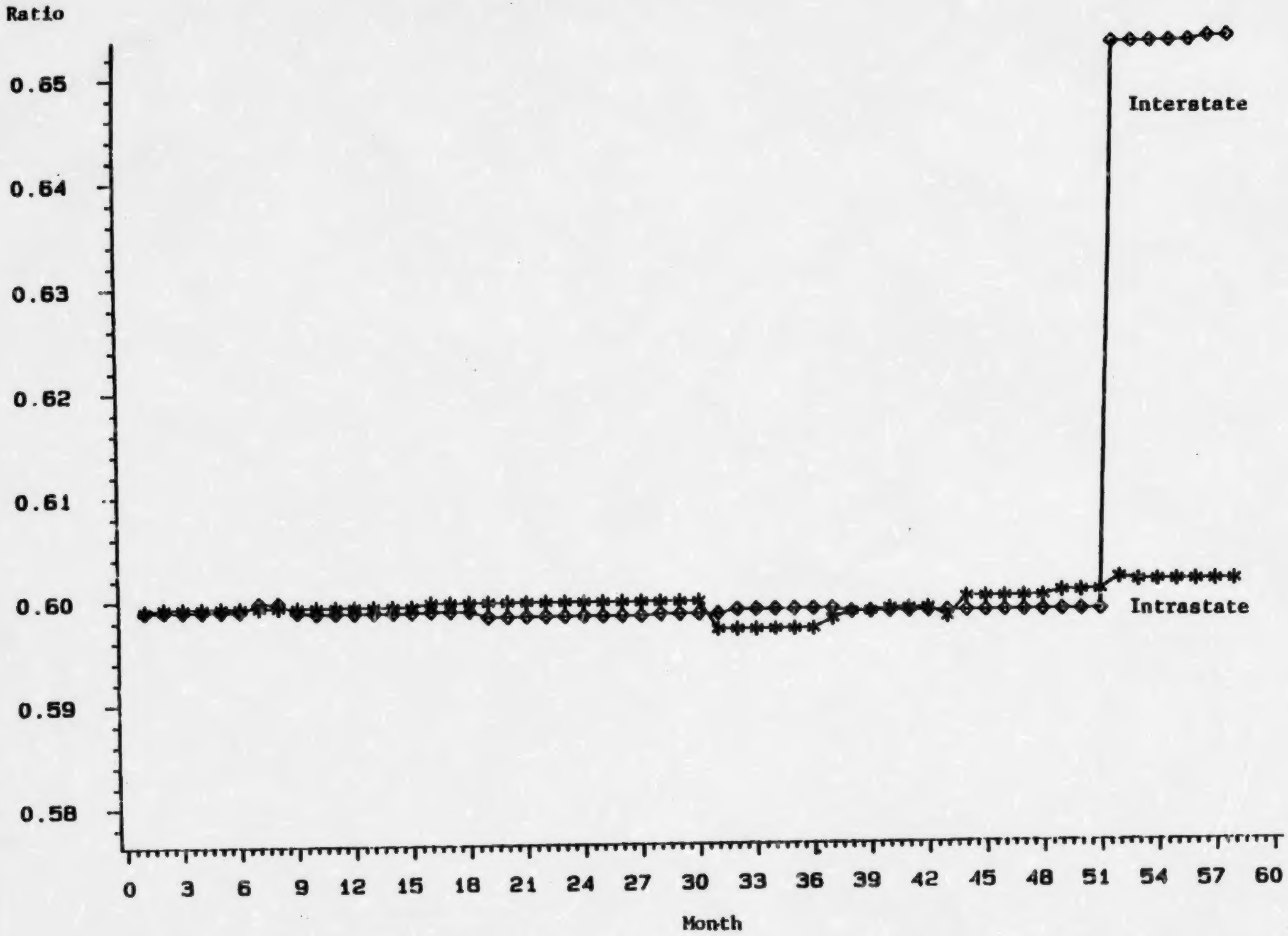

Figure 4.4 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100, Arizona Route 4, January 1980-October 1984.

NOTE: Month 1 = January 1980.

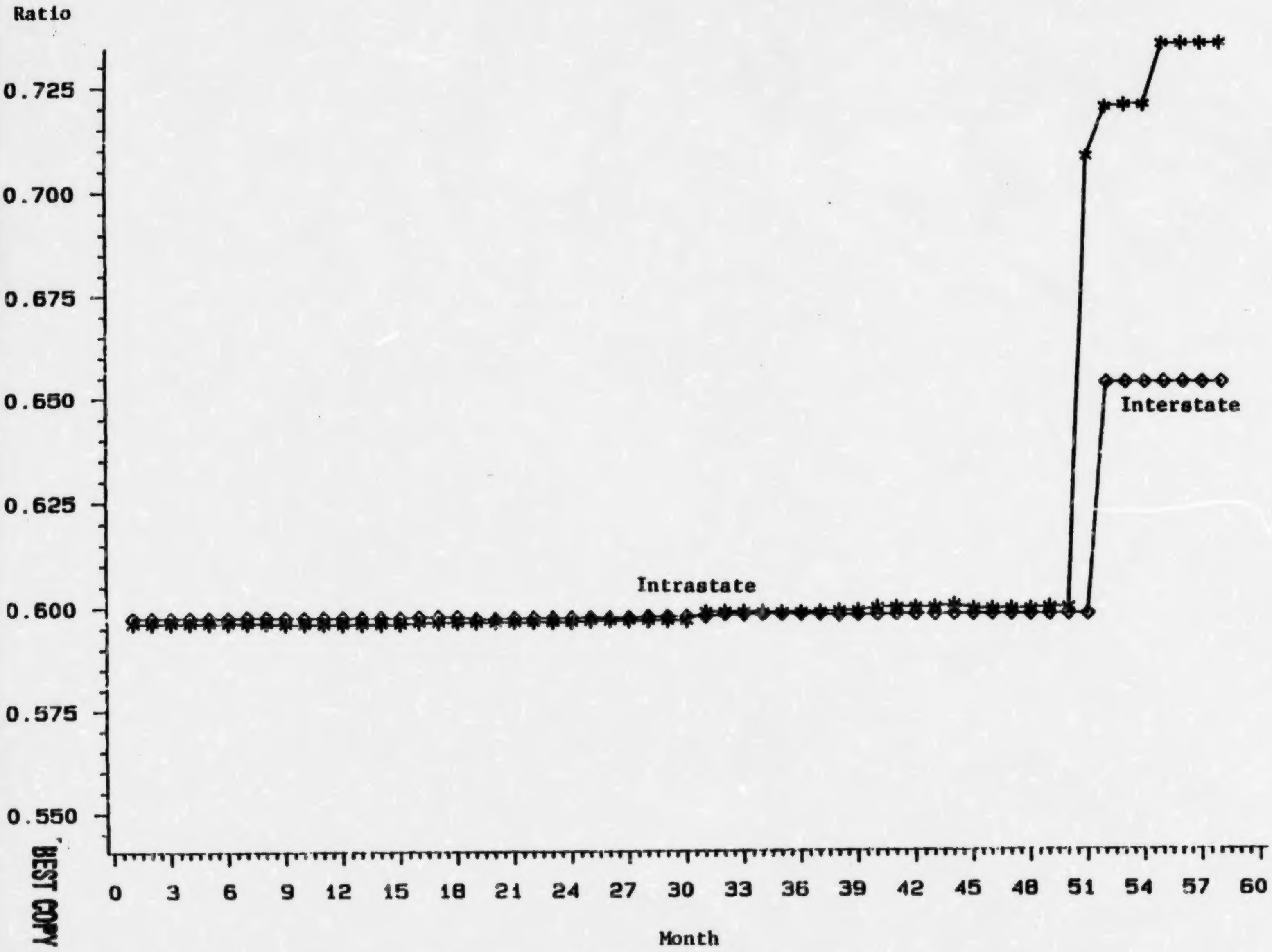

Figure 4.5 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100, Arizona Route 5, January 1980-October 1984.

NOTE: Month 1 = January 1980.

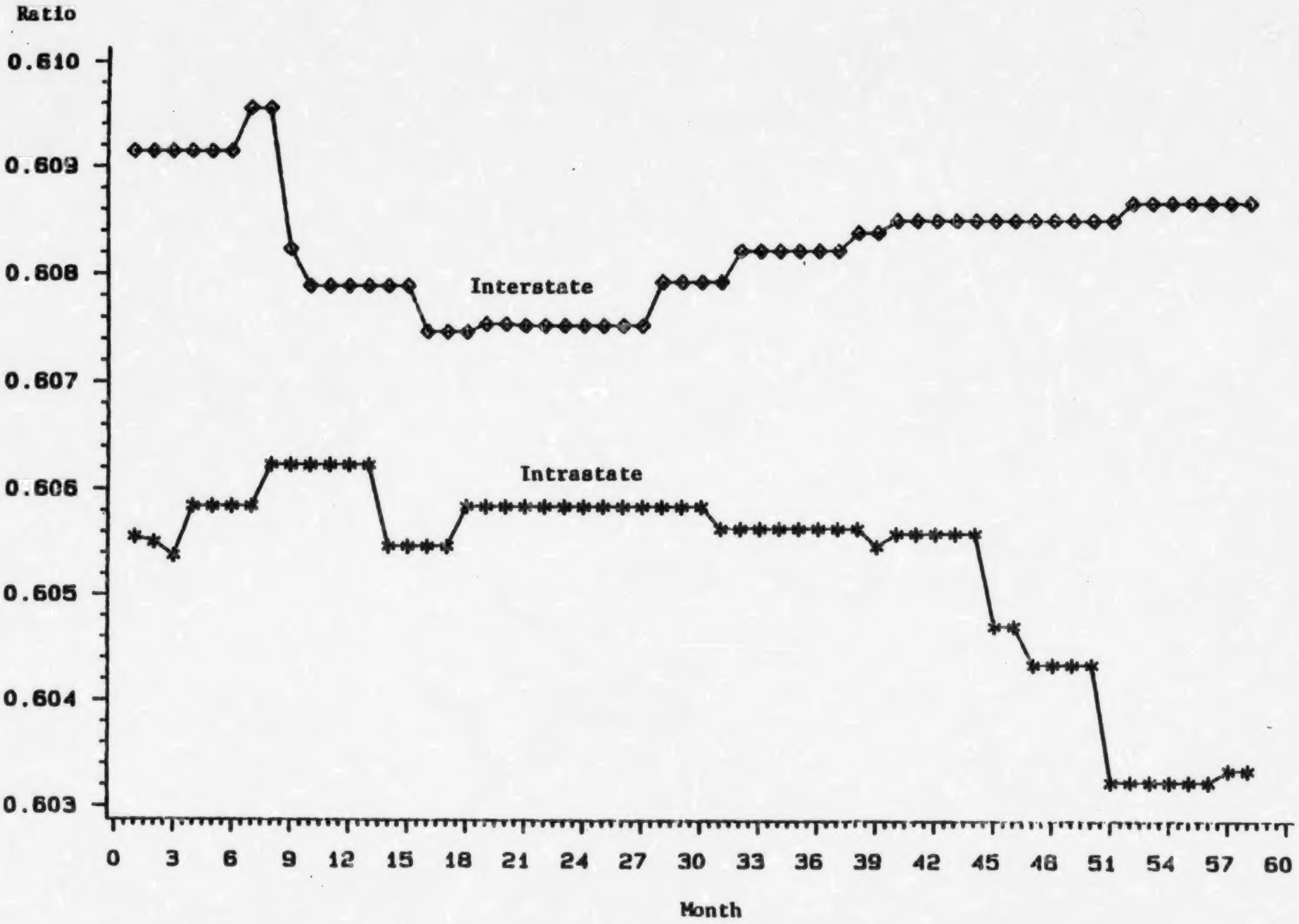

Figure 4.6 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100, Arizona Route 6, January 1980-October 1984.

NOTE: Month 1 = January 1980.

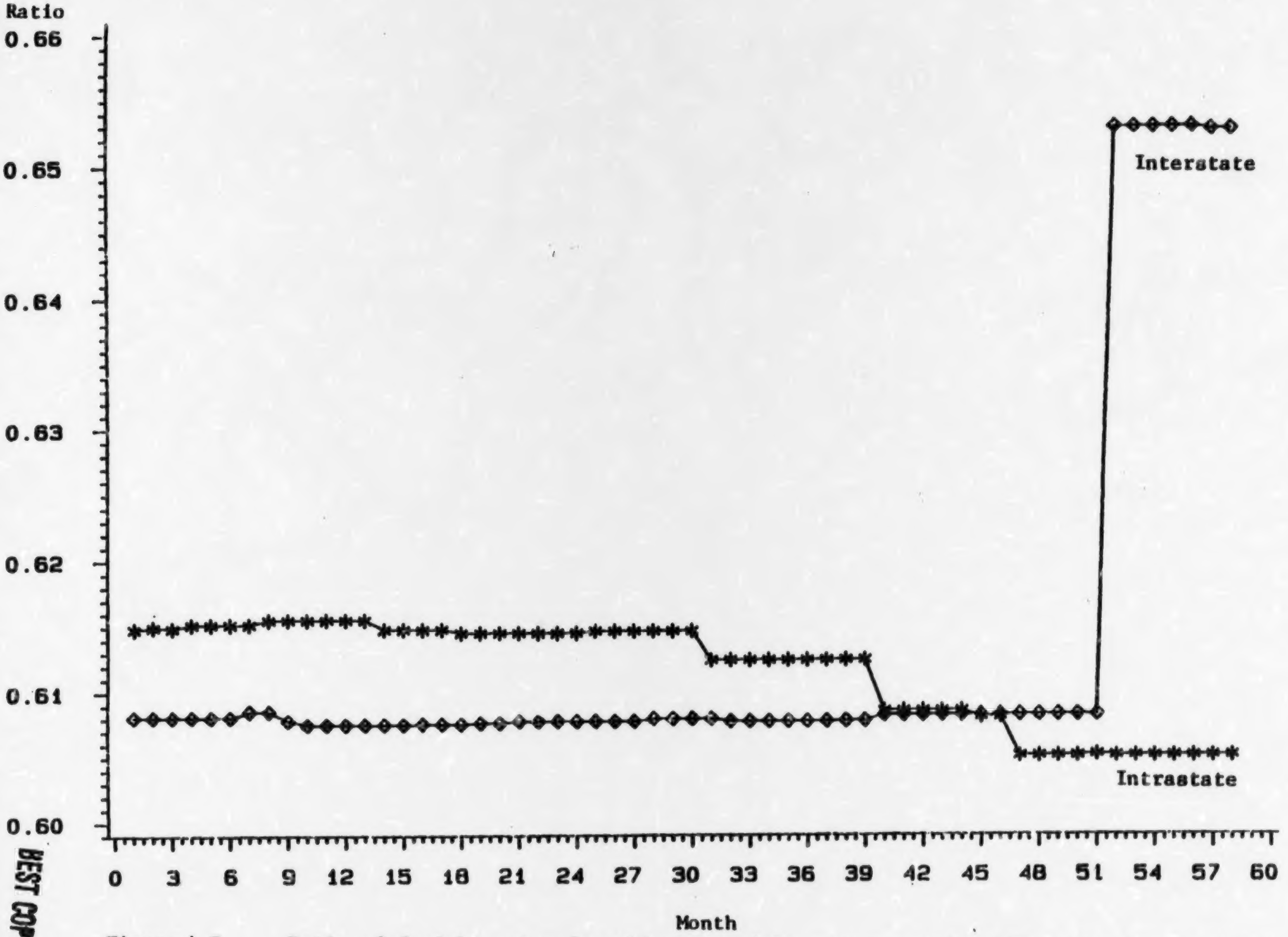

Figure 4.7 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100, Arizona Route 7, January 1980-October 1984.

NOTE: Month 1 = January 1980.

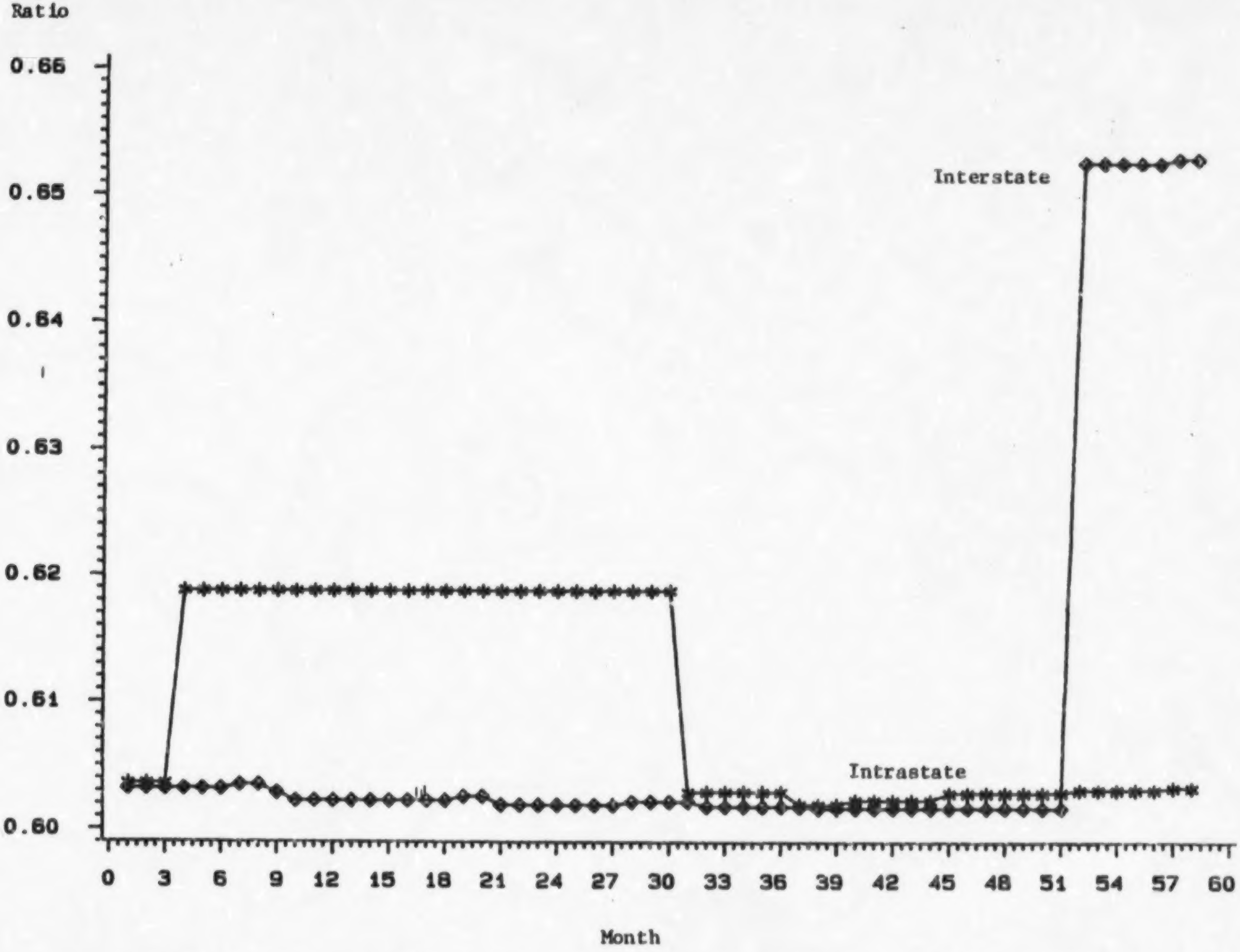

Figure 4.8 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100, Arizona Route 8, January 1980-October 1984.

NOTE: Month 1 = January 1980

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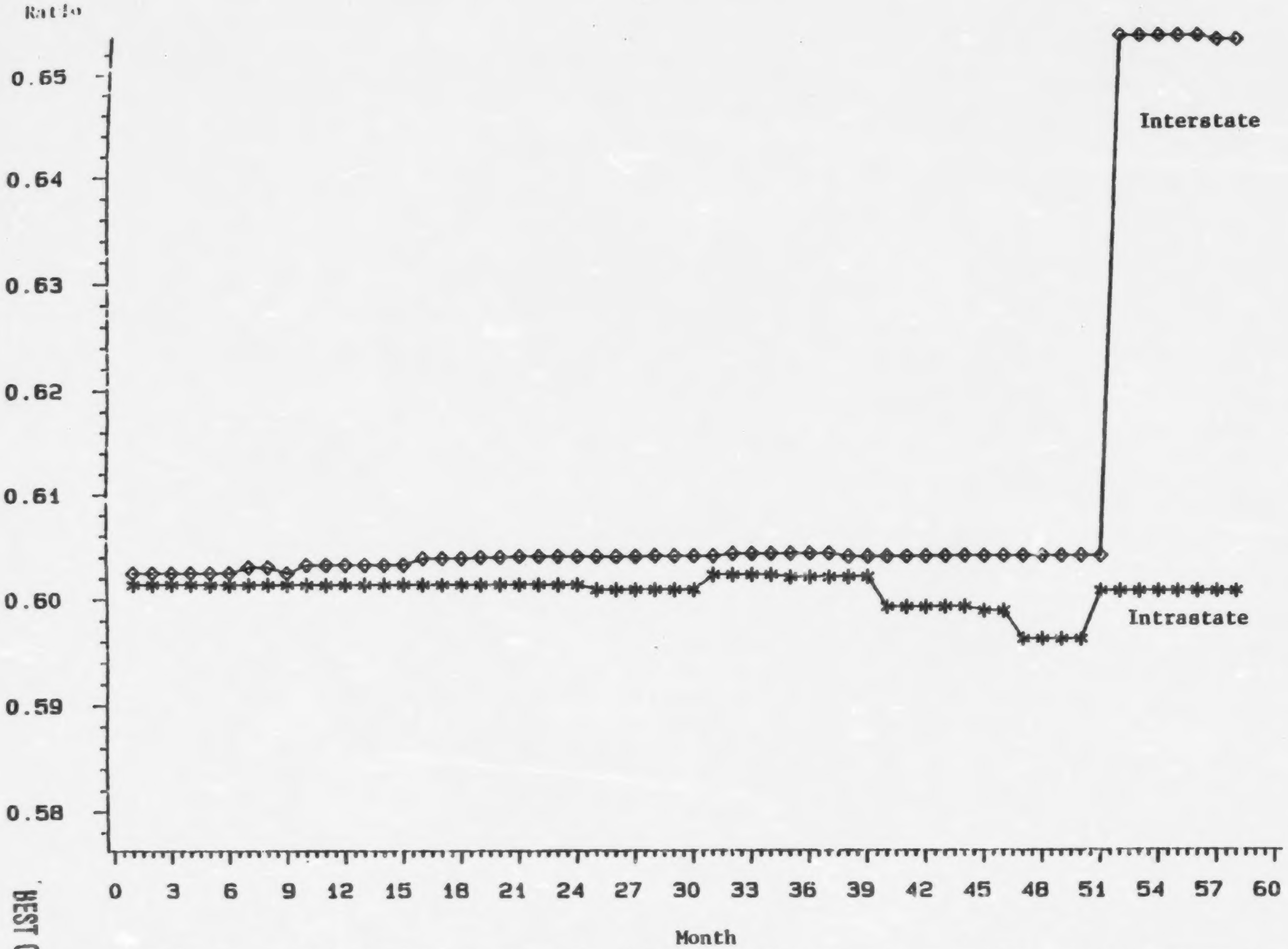

Figure 4.9 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100, Arizona Route 9, January 1980-October 1984.

NOTE: Month 1 = January 1980.

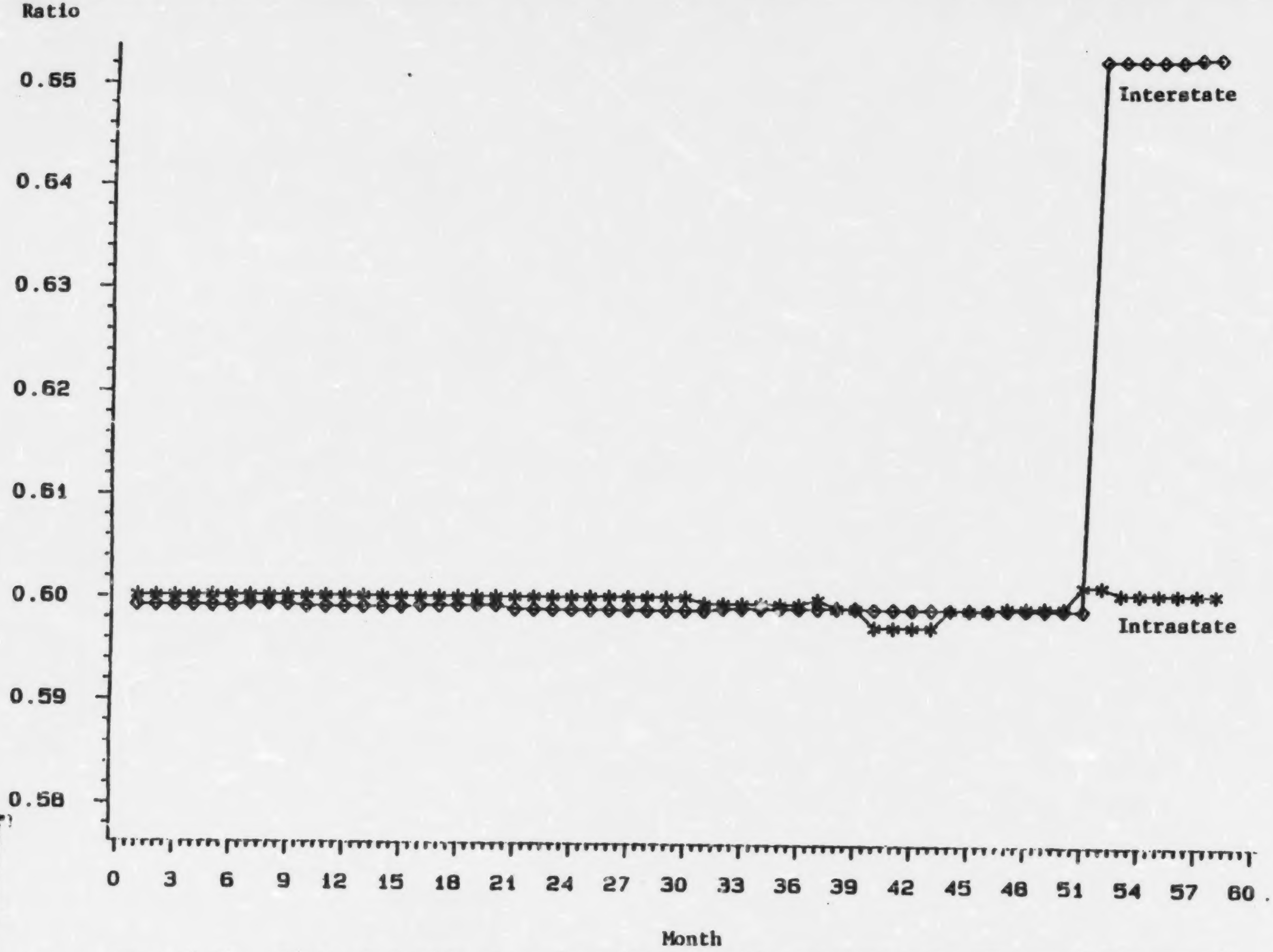

Figure 4.10 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100, Arizona Route 10, January 1980-October 1984.

NOTE: Month 1 = January 1980.

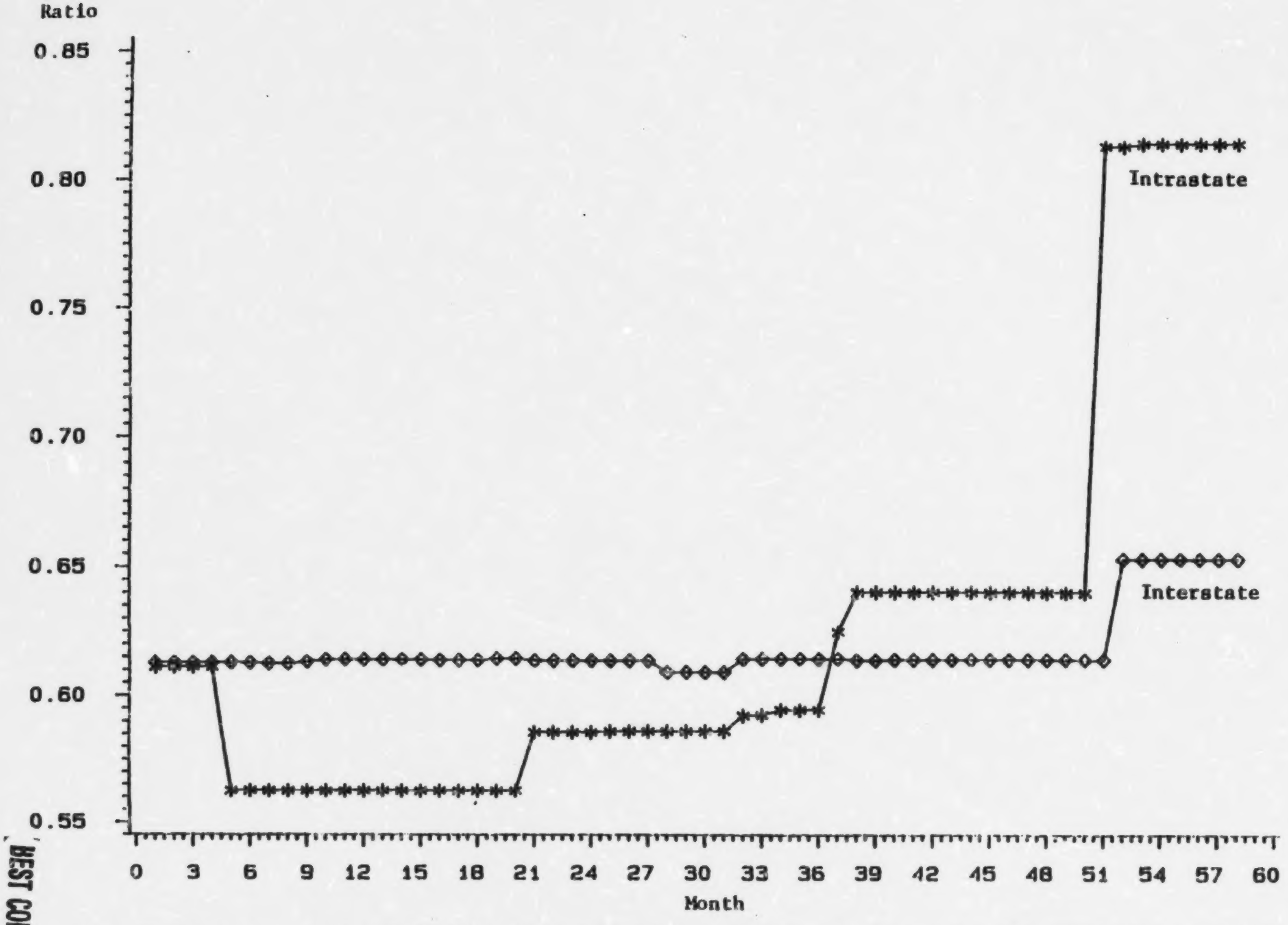

Figure 4.11 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100, Arizona Route 11, January 1980-October 984.

NOTE: Month 1 = January 1980.

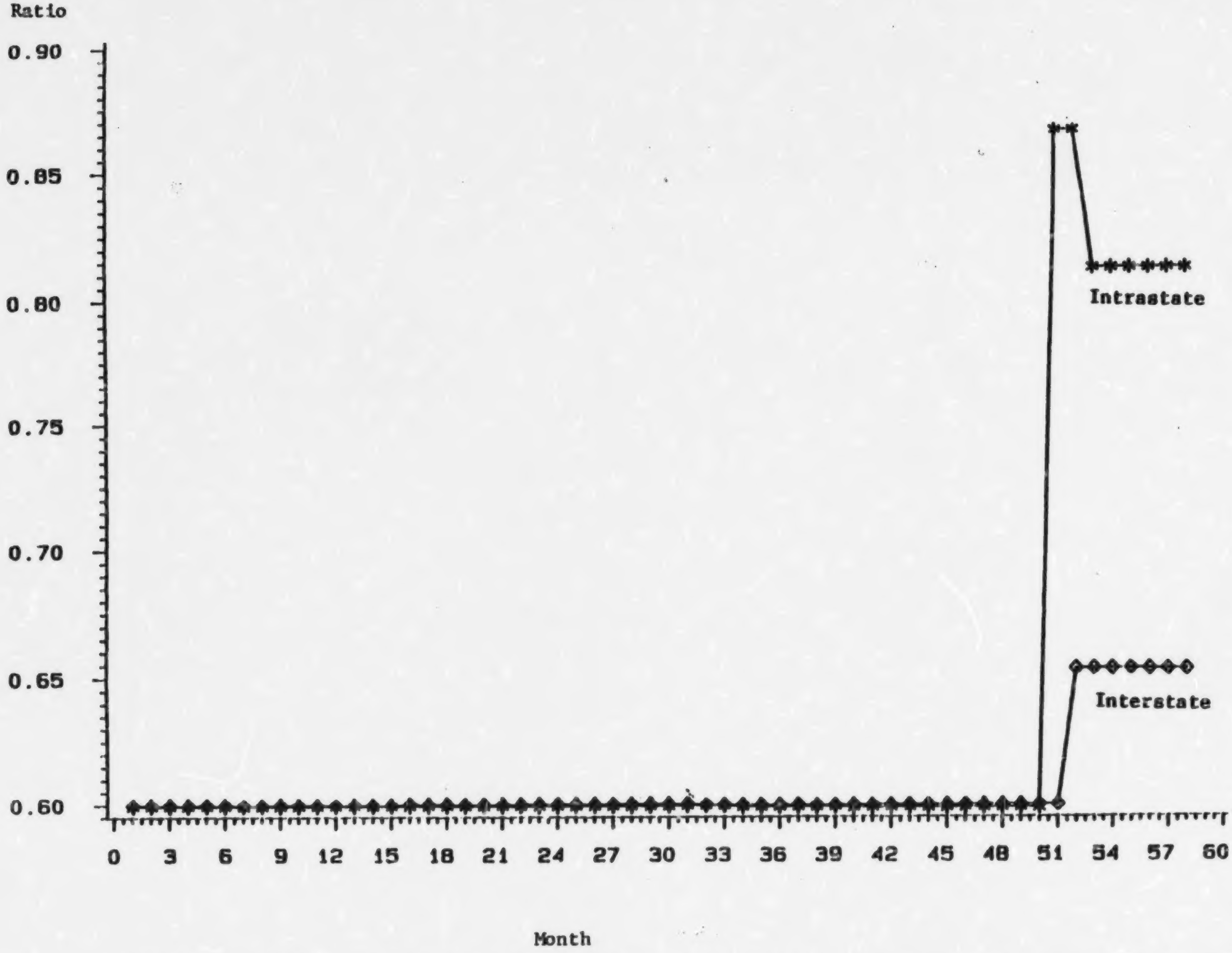

Figure 4.12 Ratio of freight rates for shipment weight category under 500 pounds for commodity class 60 and commodity class 100, Arizona Route 12, January 1980-October 1984.

NOTE: Month 1 = January 1980.

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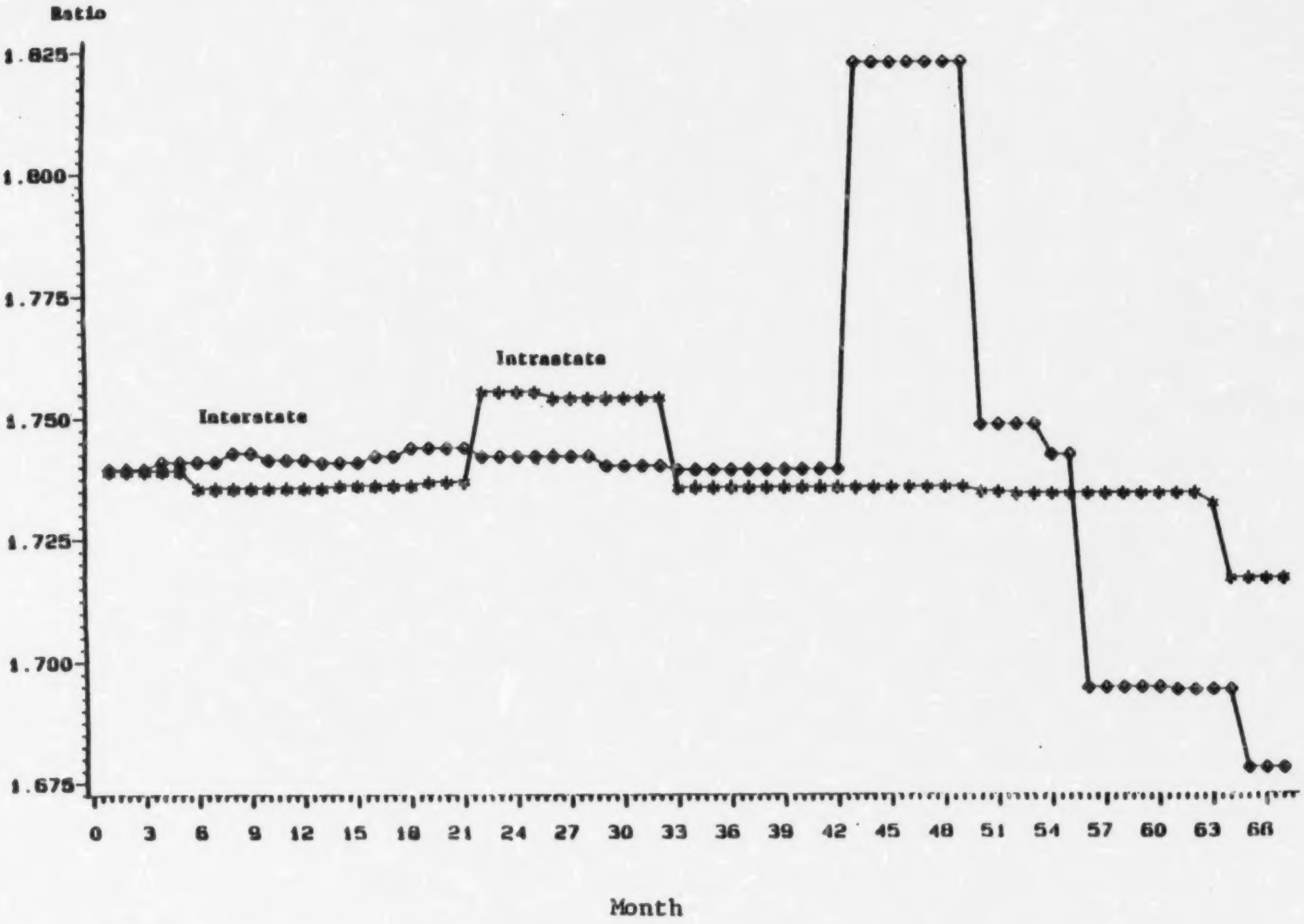

Figure 4. 13 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 1, January 1979-October 1984.

NOTE: Month 1 = January 1979.

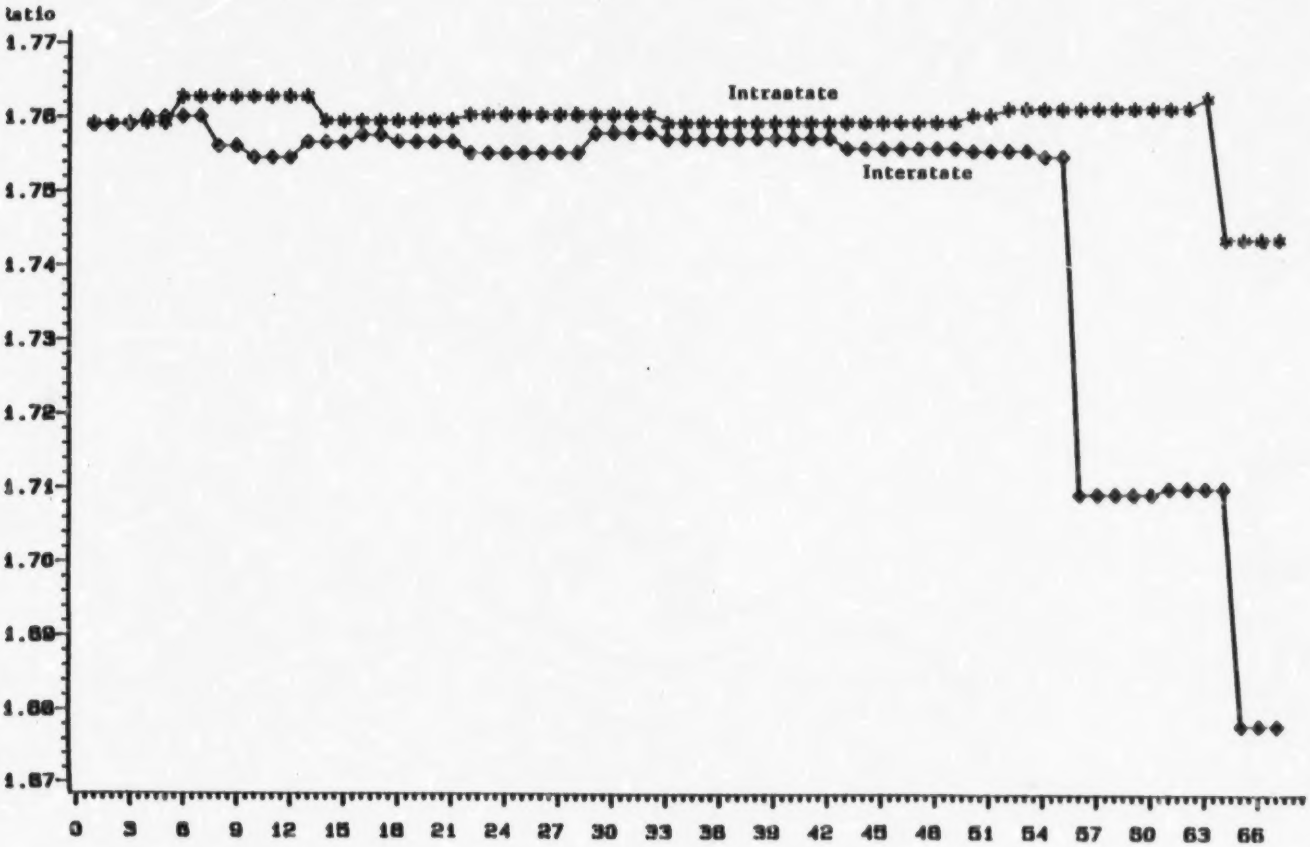

Figure 4.14 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 2, January 1979–October 1984.

NOTE: Month 1 = January 1979.

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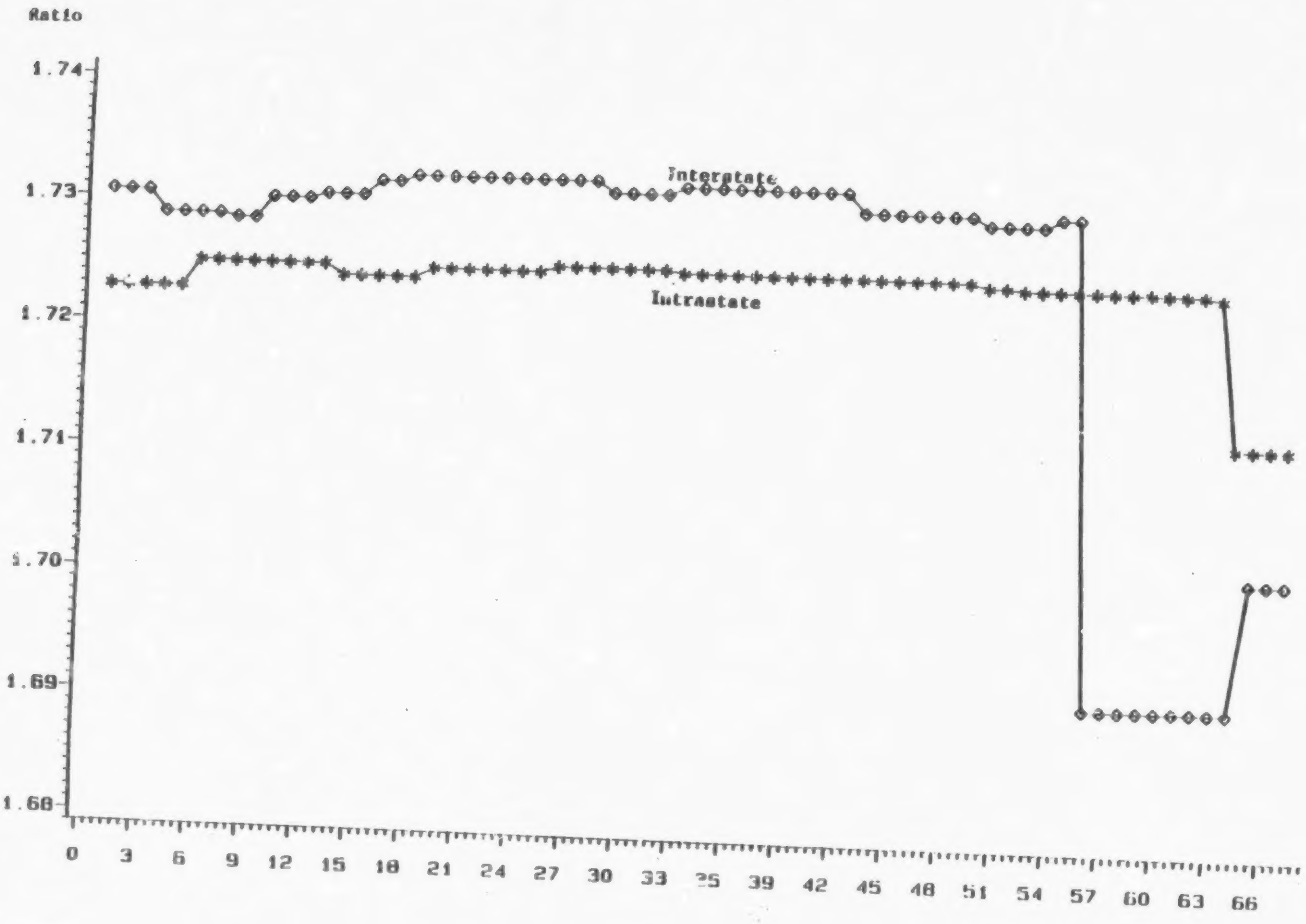

Figure 4.15 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 3, January 1979 - October 1984.

NOTE: Month 1 = January 1979.

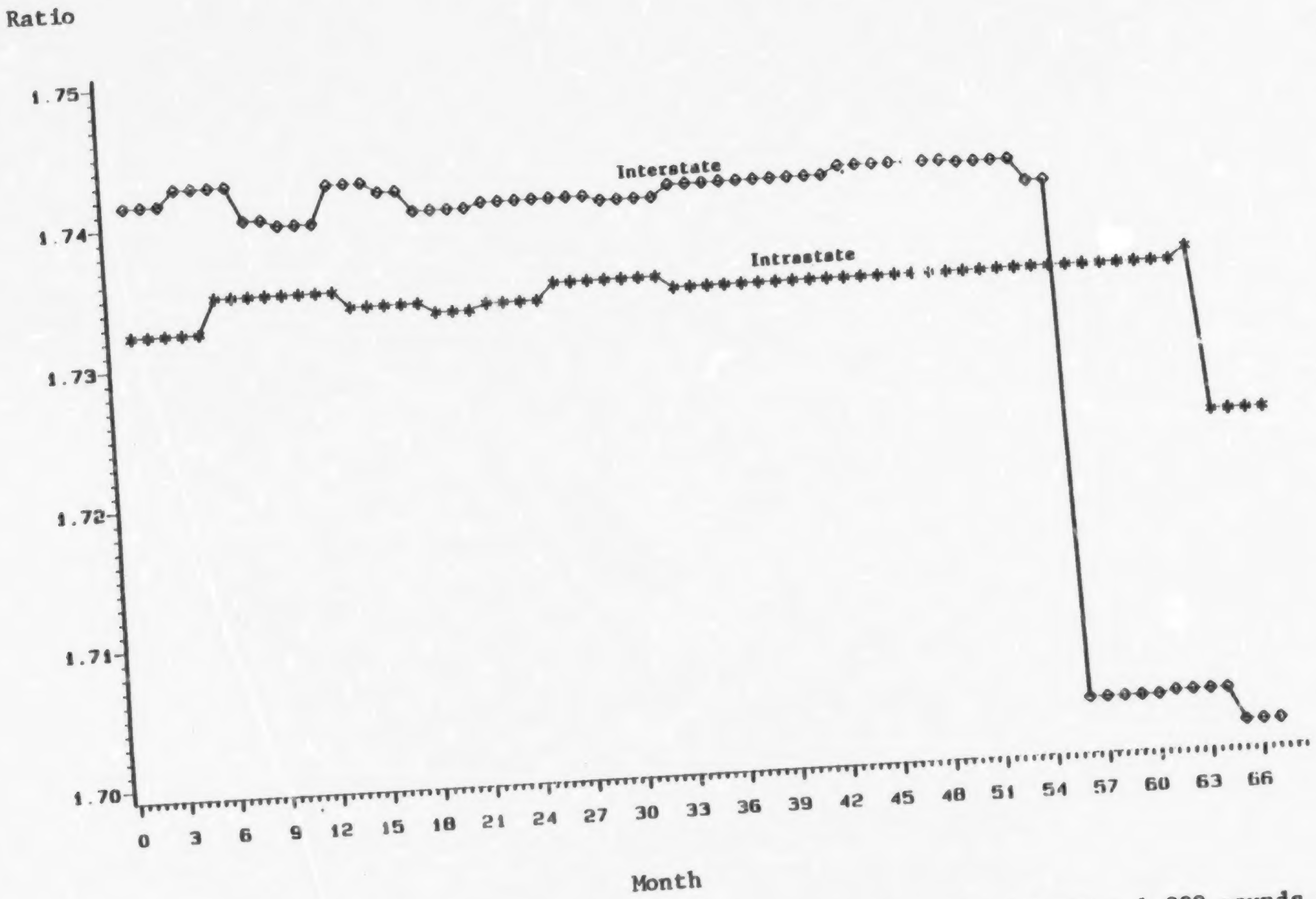

Figure 4.16 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 4, January 1979-October 1984.

NOTE: Month 1 = January 1979.

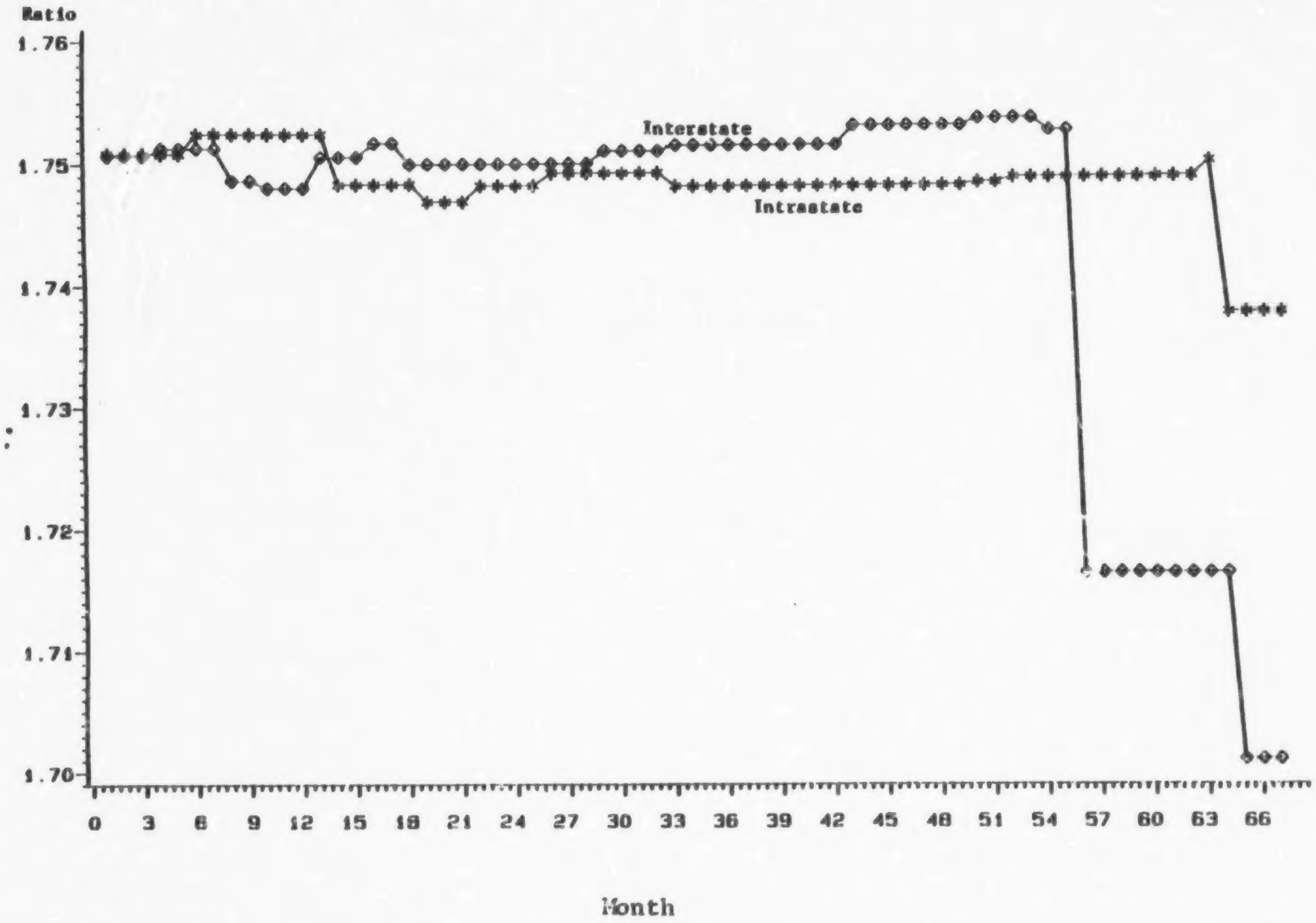

Figure 4.17 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 65, Florida Route 5, January 1979-October 1984.

NOTE: Month 1 = January 1979.

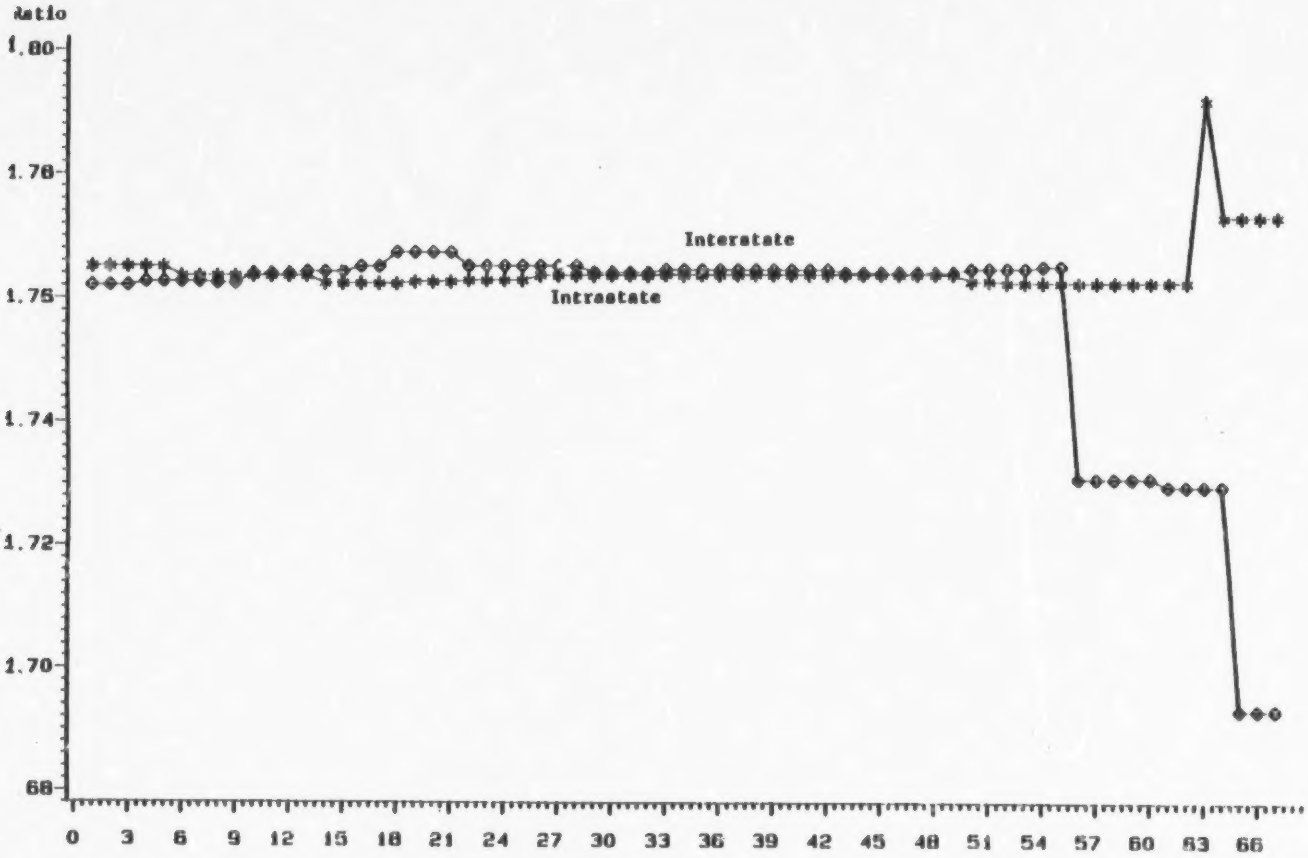

Figure 4.18 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 6, January 1979–October 1984.

NOTE: Month 1 = January 1979.

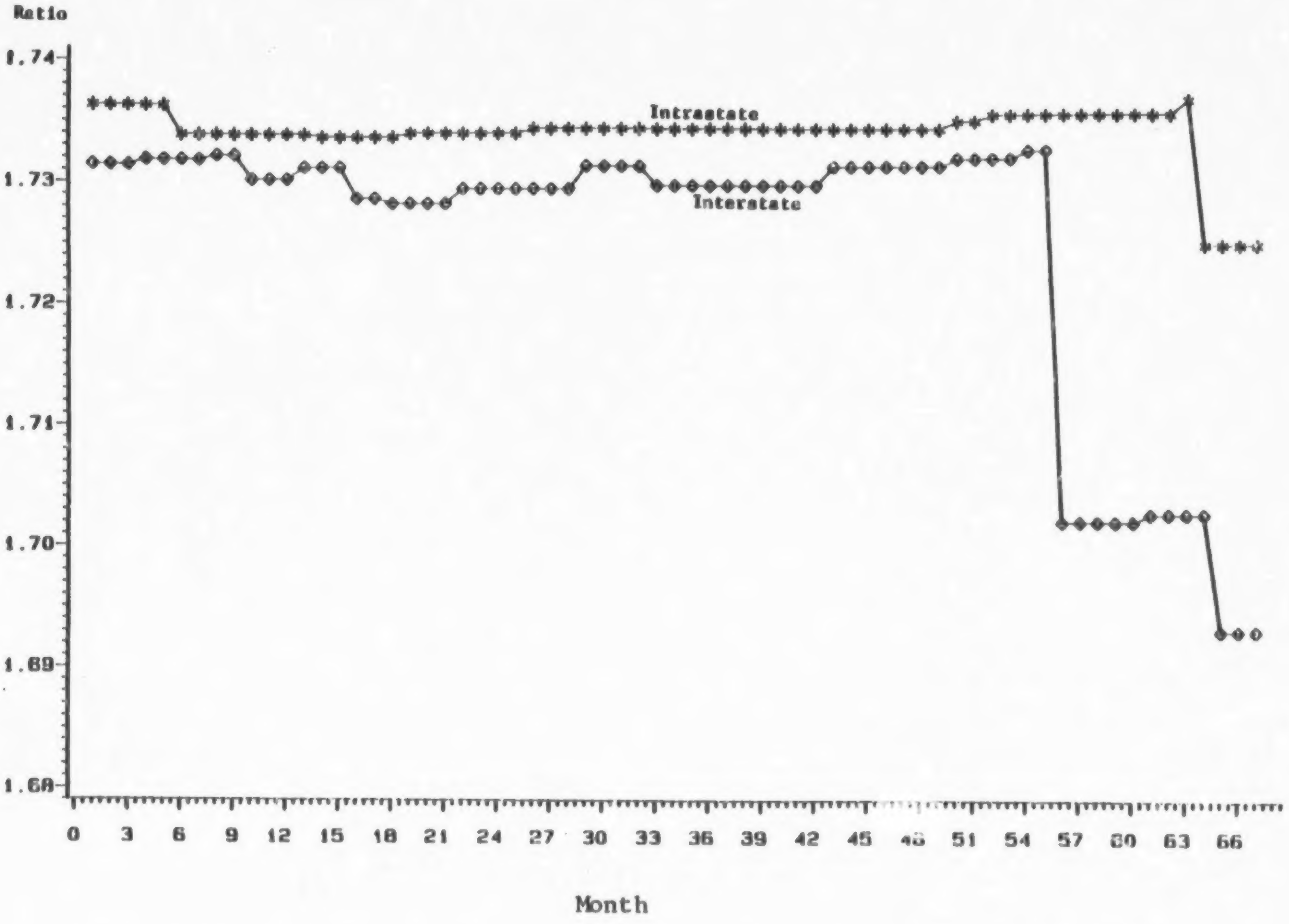

Figure 4.19 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 7, January 1979-October 1984.

NOTE: Month 1 = January 1979.

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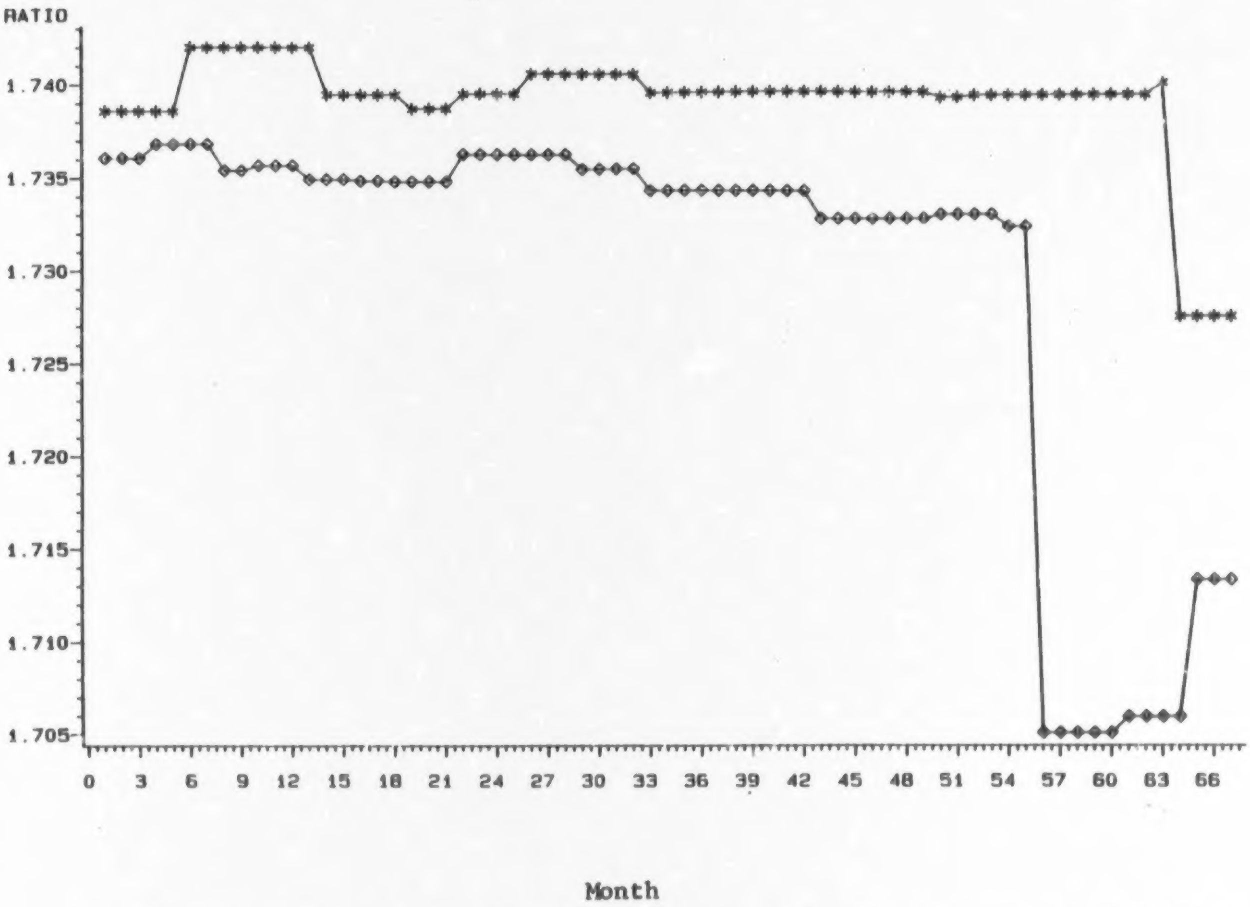

Figure 4.20 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 8, January 1979-October 1984.

NOTE: Month 1 = January 1979.

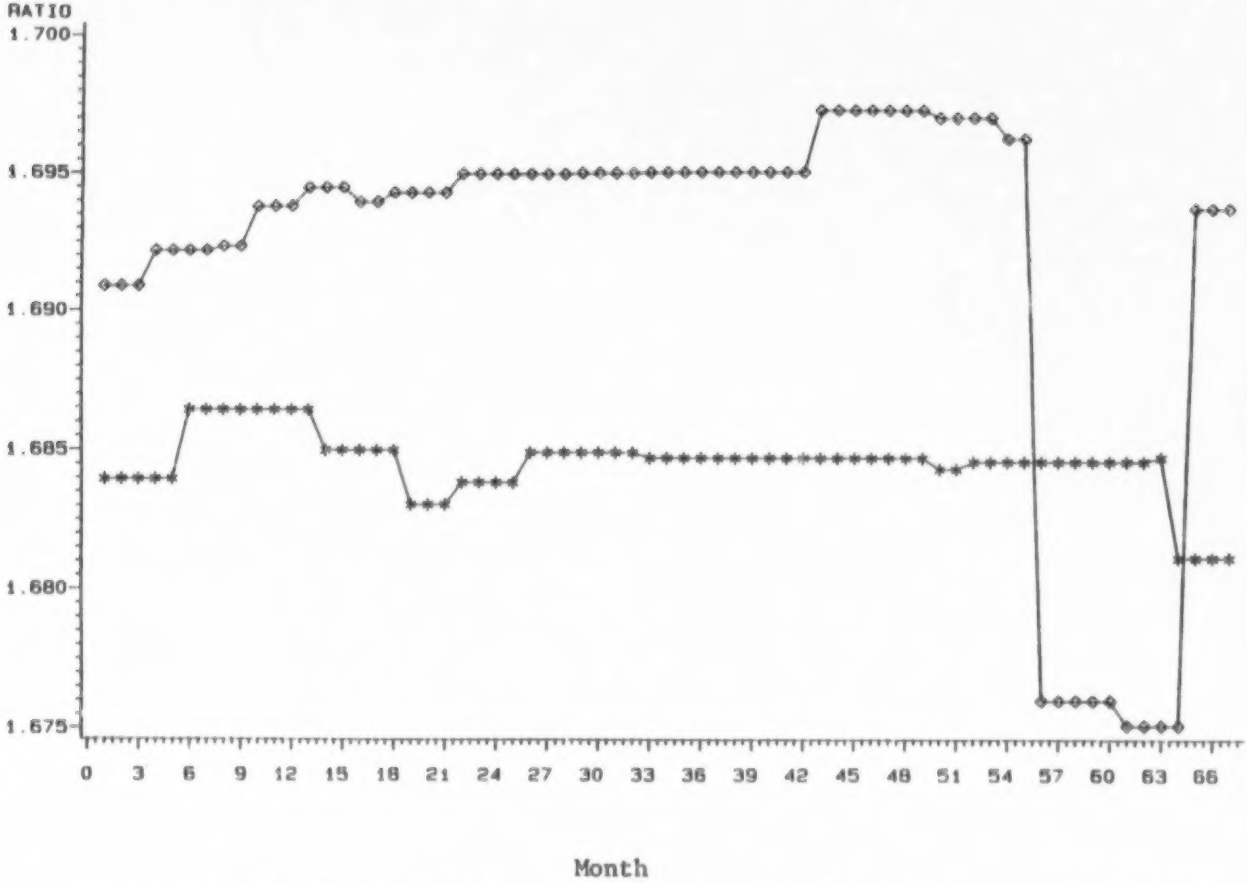

Figure 4.21 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 9, January 1979-October 1984.

NOTE: Month 1 = January 1979.

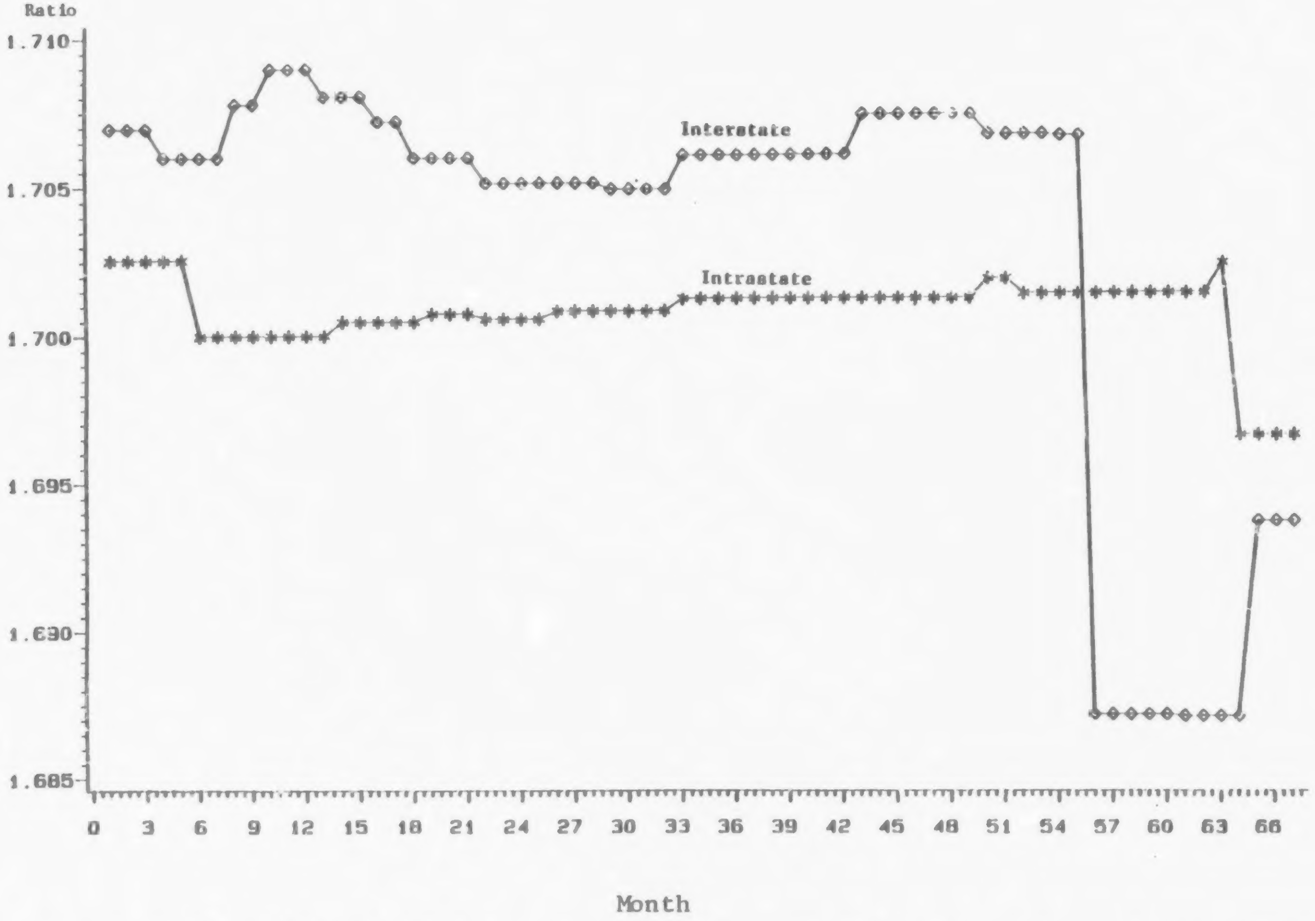

Figure 4.22 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 10, January 1979-October 1984.

NOTE: Month 1 = January 1979.

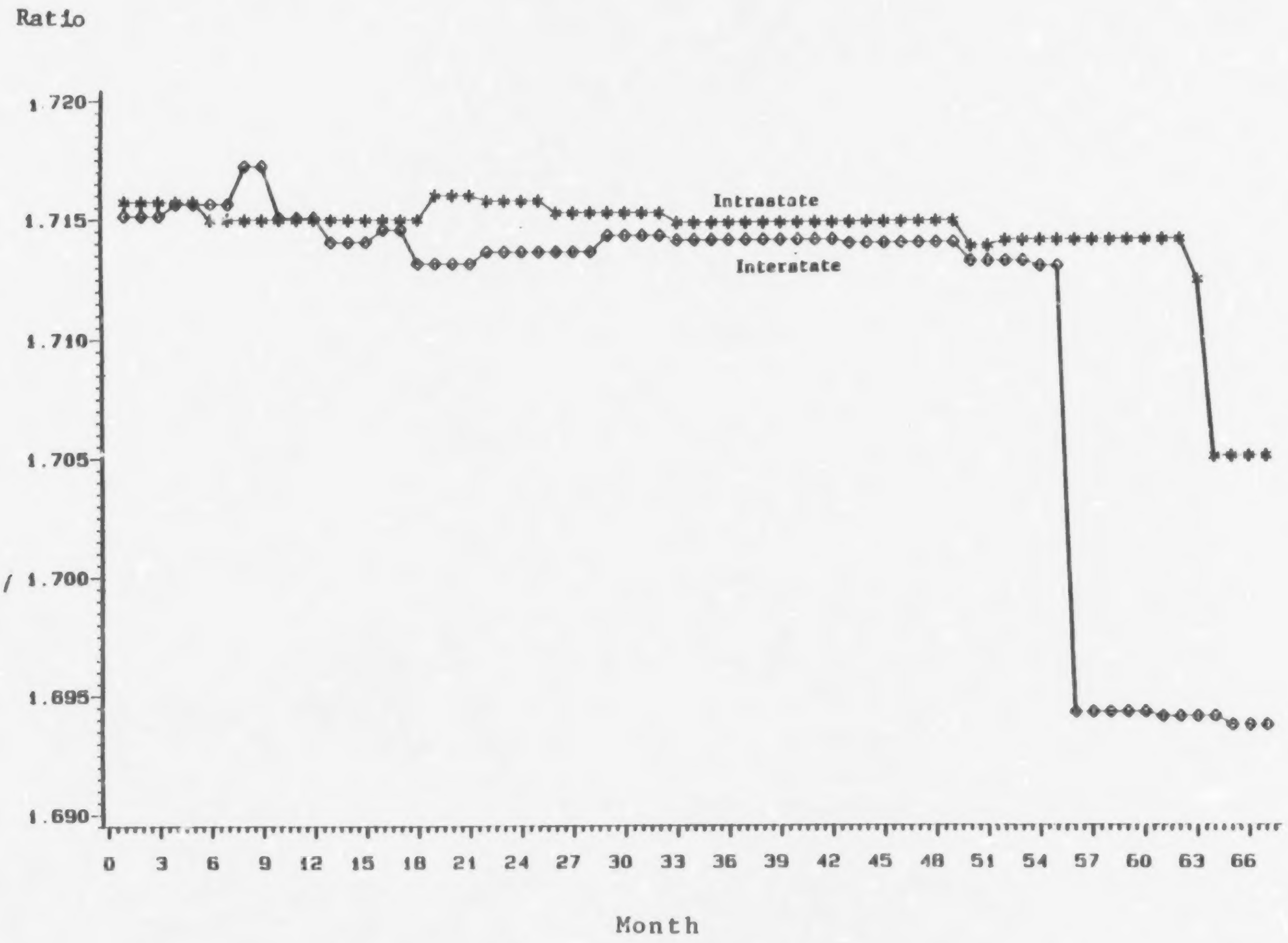

Figure 4. 23 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 11, January 1979-October 1984.

NOTE: Month 1 = January 1979.

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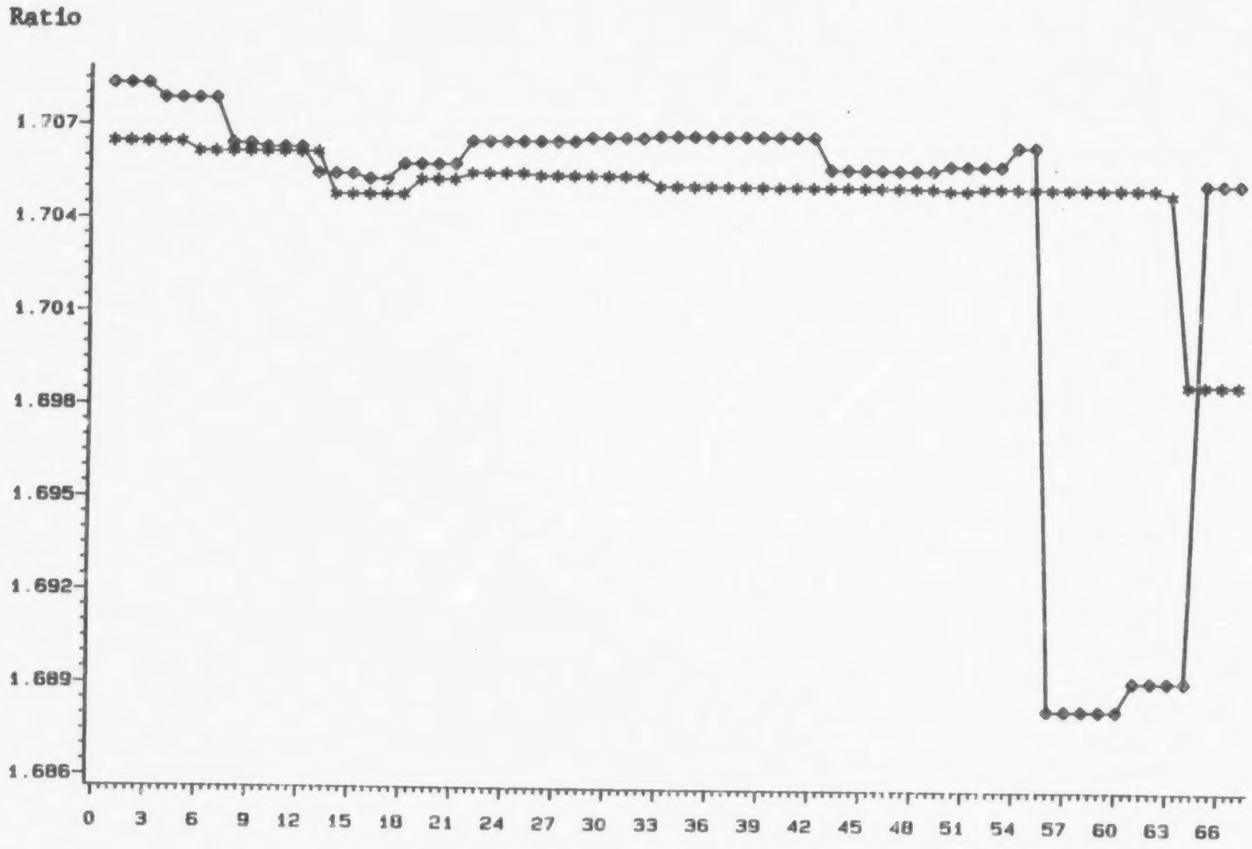

Figure 4.24 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 12, January 1979-October 1984.

NOTE: Month 1 = January 1979.

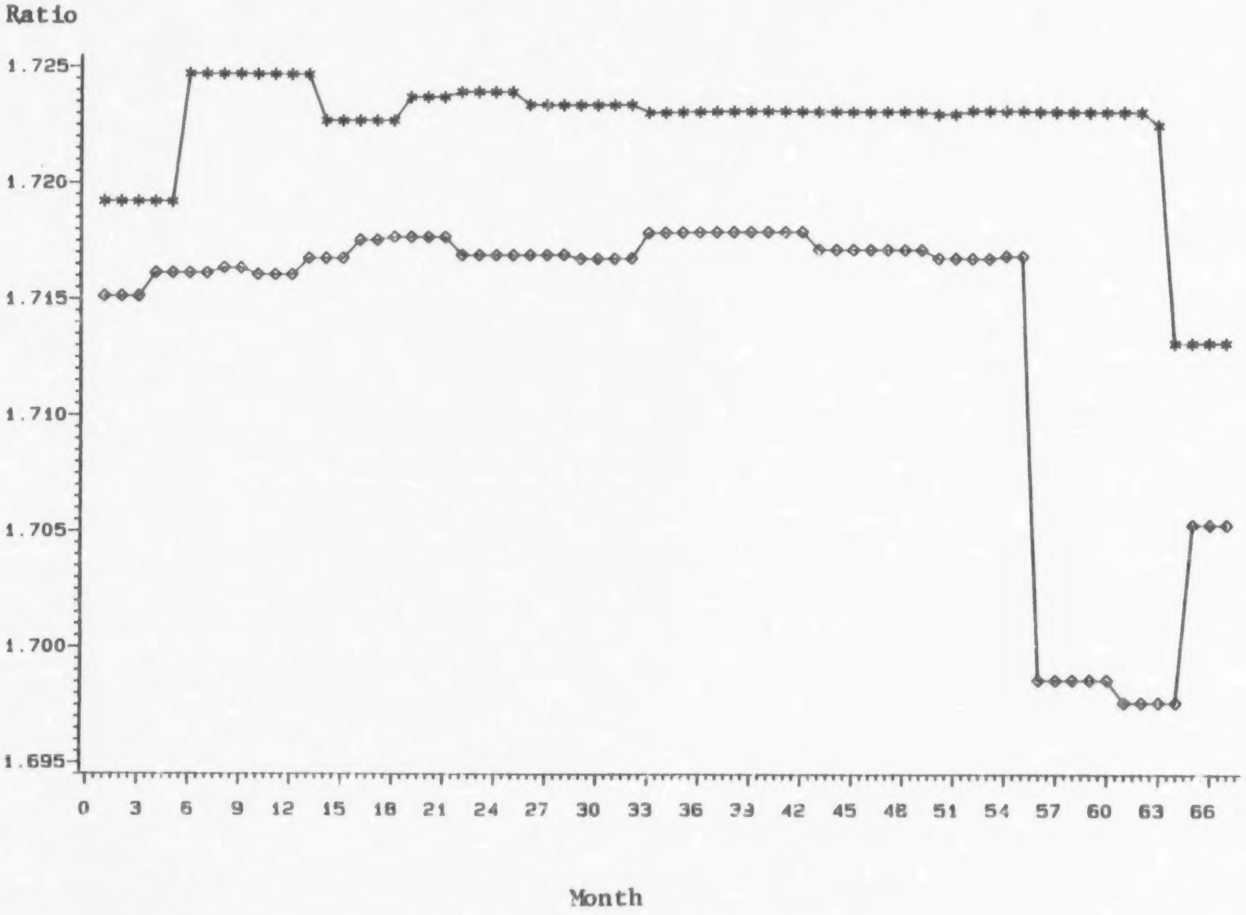

Figure 4.25 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 13, January 1979–October 1984.

NOTE: Month 1 = January 1979.

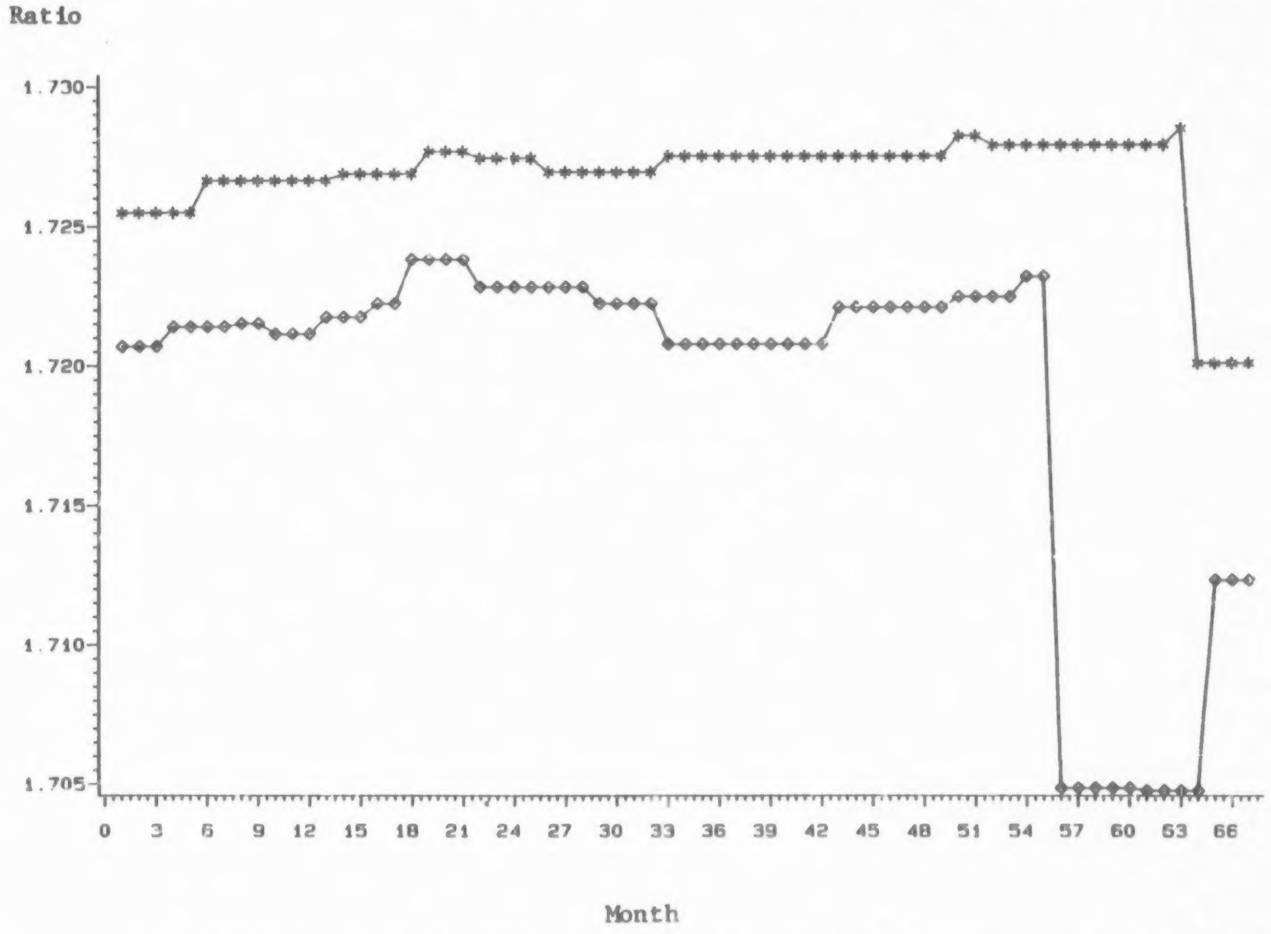

Figure 4.26 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 14, January 1979-October 1984.

NOTE: Month 1 = January 1979.

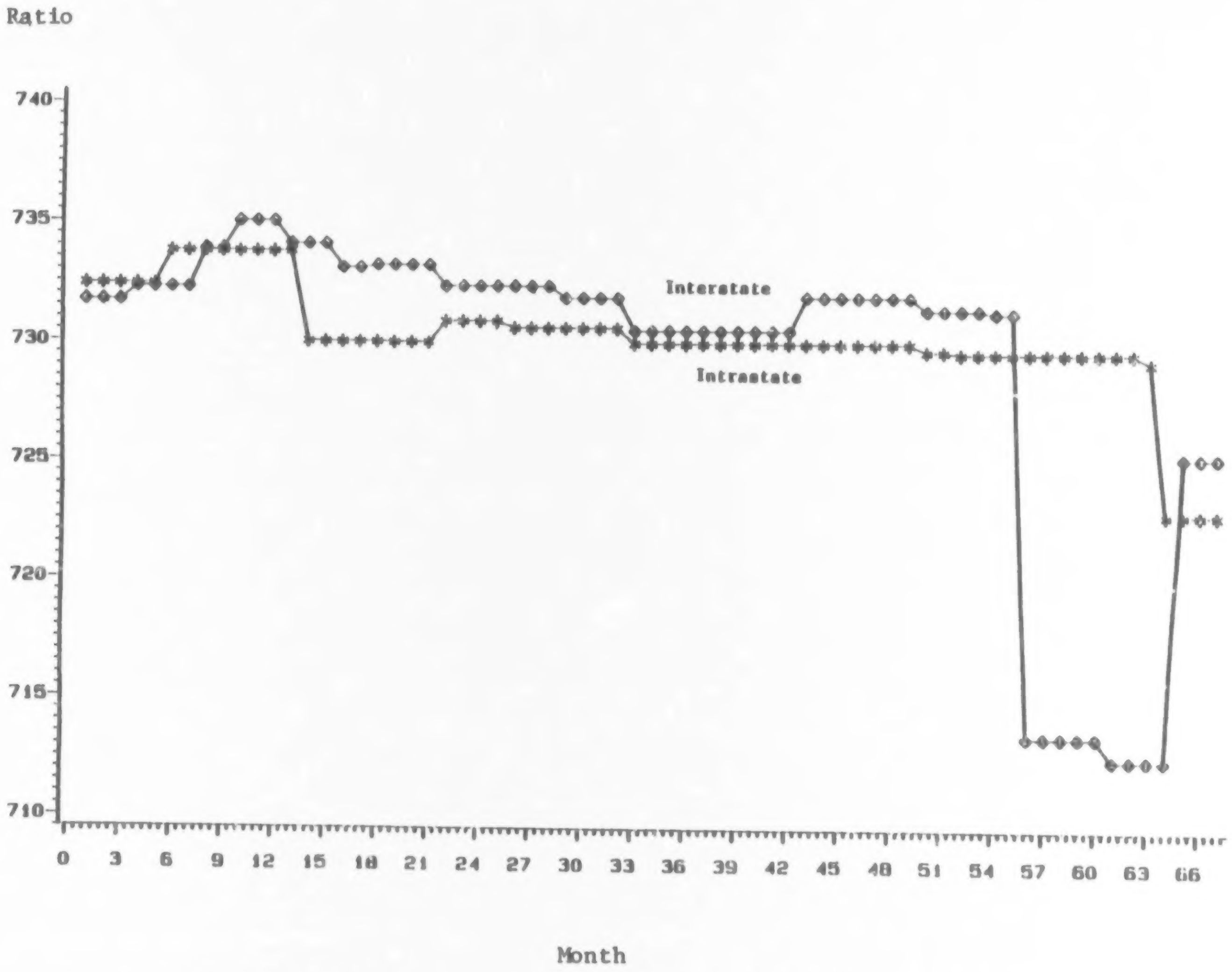

Figure 4.27 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 15, January 1979-October 1984.

NOTE: Month 1 = January 1979.

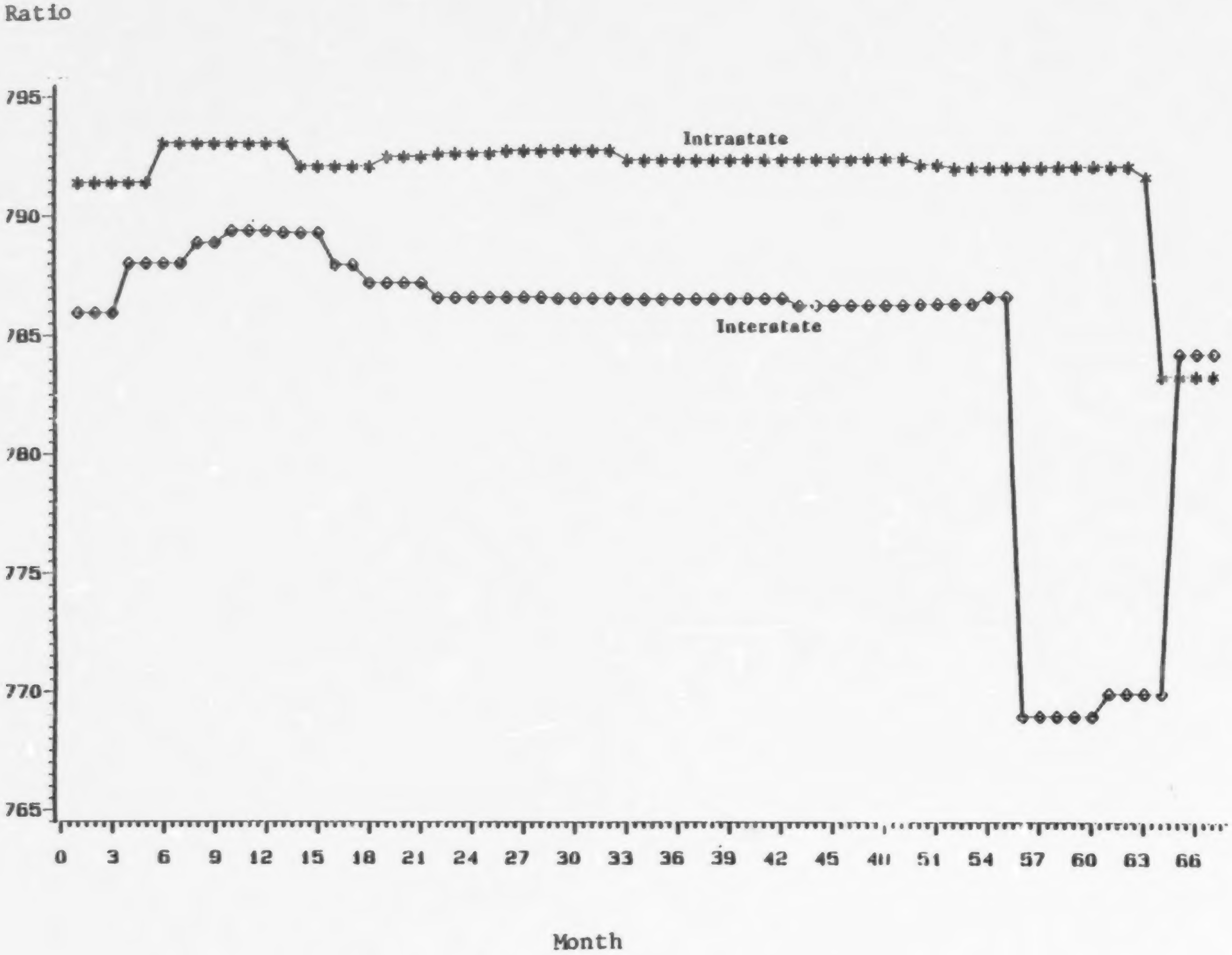

Figure 4.28 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 16, January 1979-October 1984.

NOTE: Month 1 = January 1979.

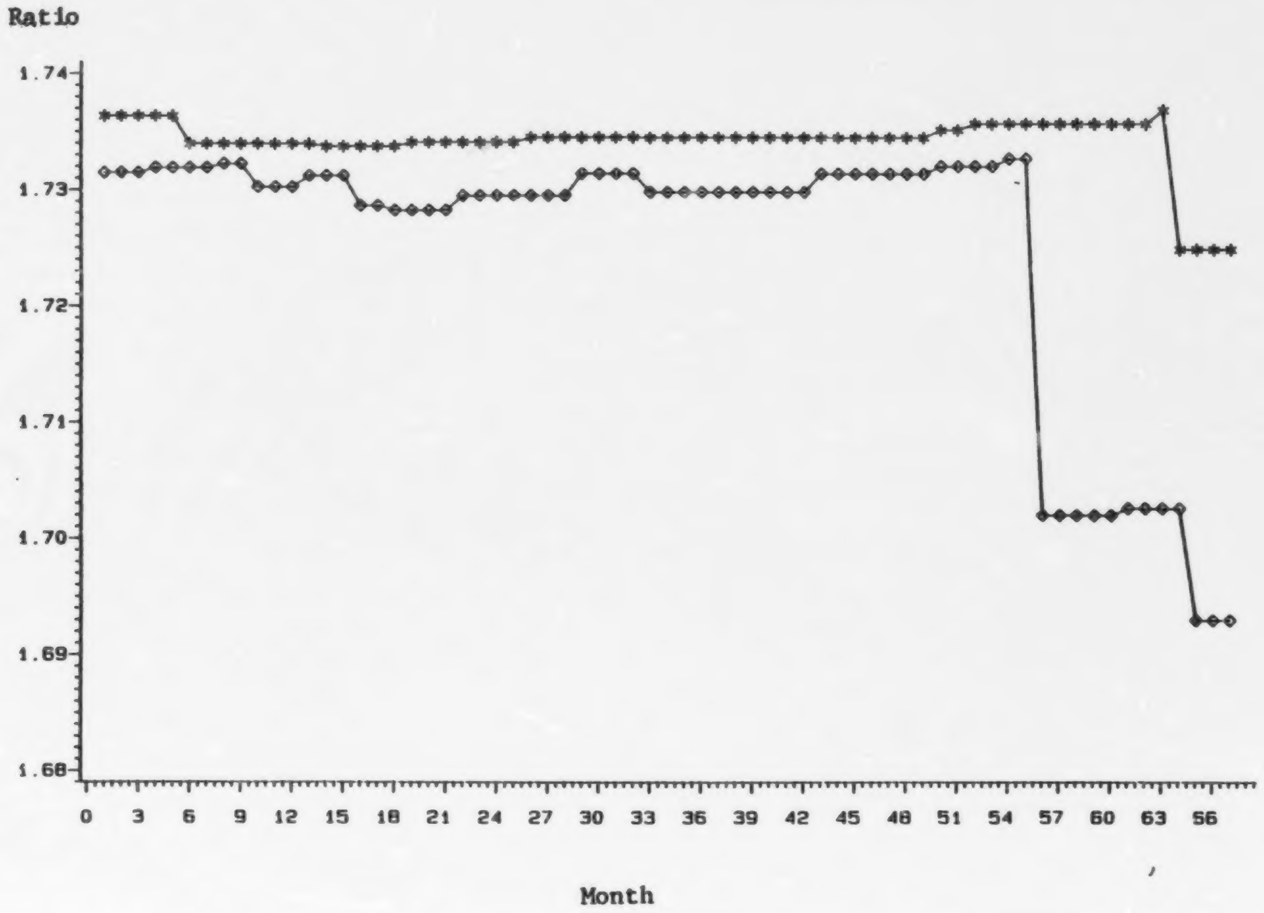

Figure 4.29 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 17, January 1979-October 1984.

NOTE: Month 1 = January 1979.

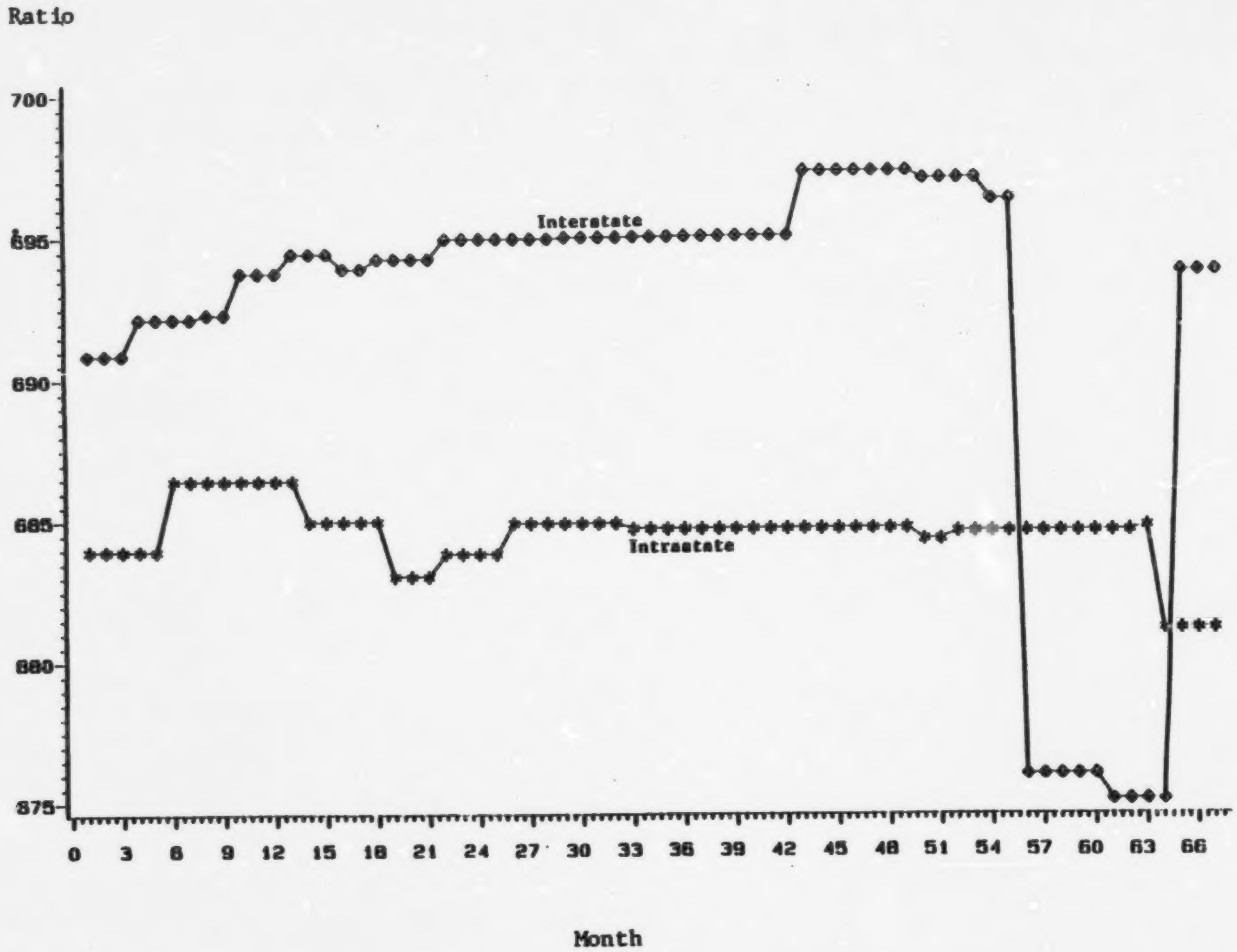

Figure 4.30 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 18, January 1979-October 1984.

NOTE: Month 1 = January 1979.

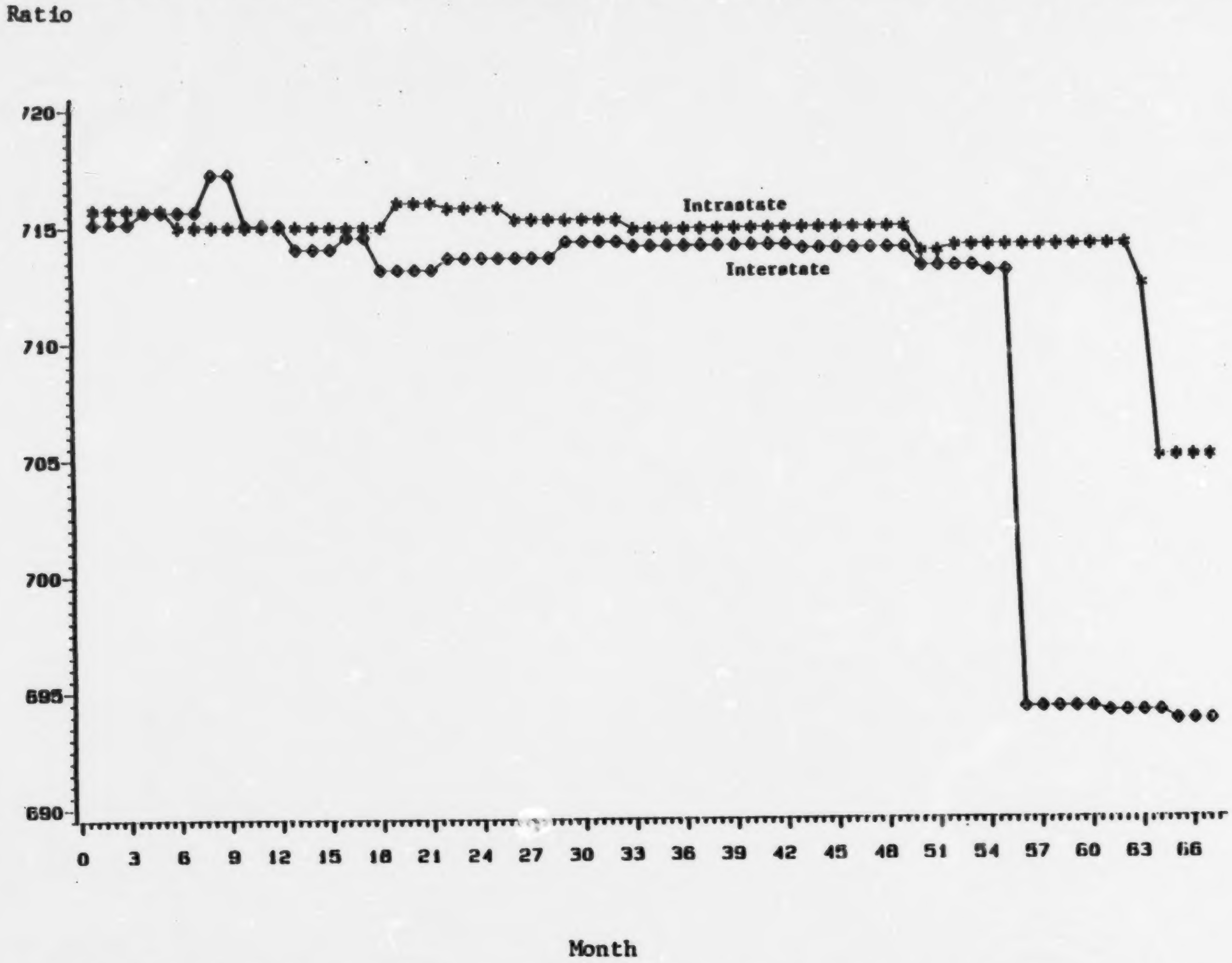

Figure 4.31 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 19, January 1979-October 1984.

NOTE: Month 1 = January 1979.

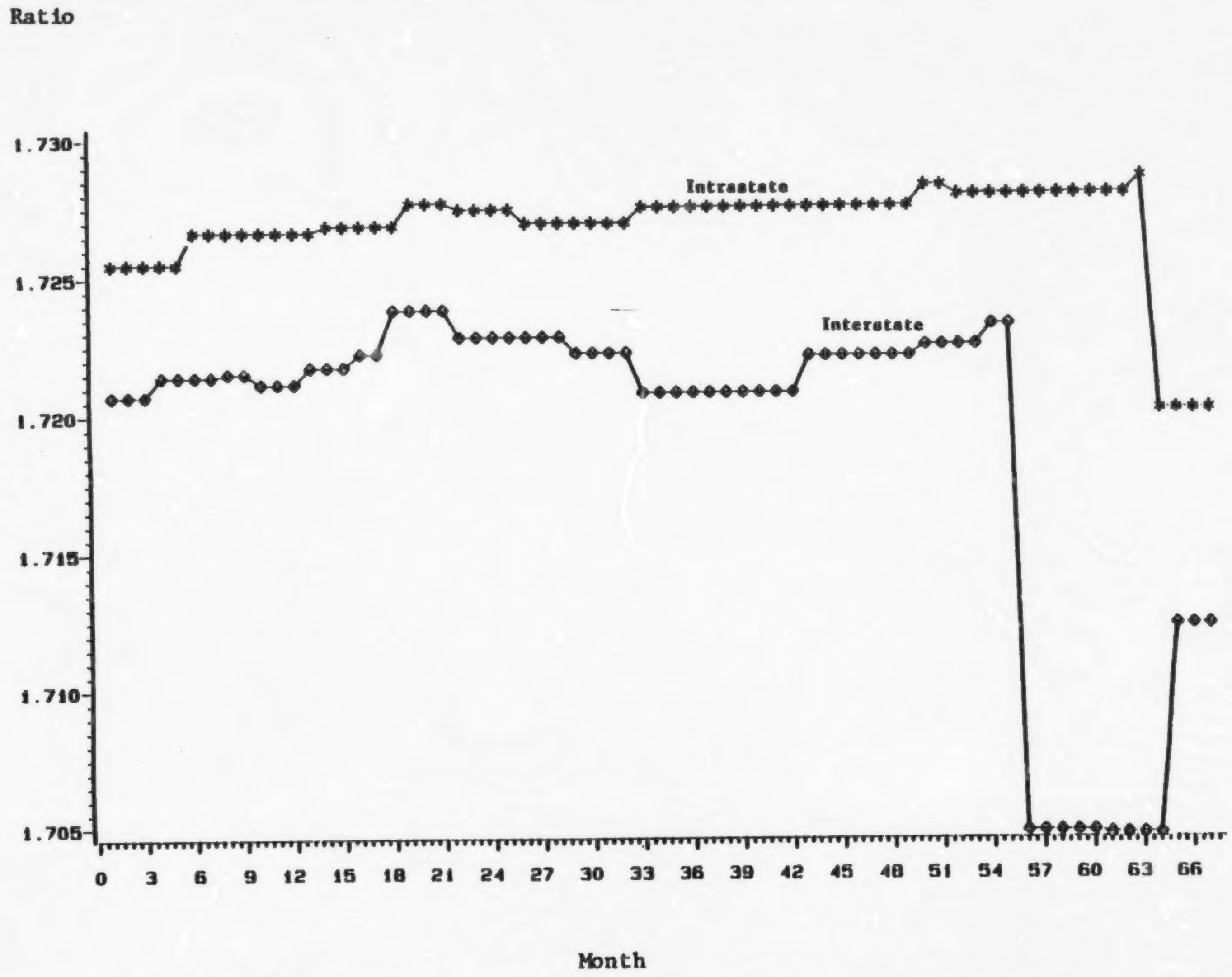

Figure 4.32 Ratio of freight rates for shipment weight category under 1,000 pounds for commodity class 125 and commodity class 65, Florida Route 20, January 1979-October 1984.

NOTE: Month 1 = January 1979.

APPENDIX 5

ROUTE-BY-ROUTE ESTIMATIONS

In this appendix route-by-route freight rate estimations are presented. These correspond to the pooled regressions, Model 1, in Tables 13 and 14. For both Arizona and Florida, the individual route regressions explained significantly more of the variation than did the pooled regressions.[1] The individual regressions are not discussed in the text, because in almost all cases the signs and levels of significance for the estimated parameters in the pooled and the individual route regressions are the same. Therefore, the overall message or policy implication from the individual and the pooled regressions would be the same.

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[1] The estimated F statistics associated with the Chow test between the full models (individual route regressions) and the restricted models (pooled regression) are significantly different from zero at the .01 level.

ARIZONA

Table 1A. Route-by-Route Freight Rate Estimation - Arizona.

Independent Variable	Parameter Estimate (t statistics are in parenthesis)			
	Route 1	Route 2	Route 3	Route 4
Intercept	229.6* (3.365)	178.1 (1.516)	272.2* (2.835)	-759.6* (-5.916)
Shipment weight	-.01646* (-76.81)	-.01919* (-58.29)	-.01724* (-55.95)	-.01841* (-44.68)
Fuel cost	2.420* (5.421)	3.891* (4.986)	2.366* (3.771)	11.20* (13.34)
Unemployment rate	3.218 (.9740)	4.148 (.8210)	8.949 (1.832)	14.16 (2.167)
Commodity class 70	52.00* (9.505)	62.69* (7.459)	60.40* (7.680)*	81.07* (7.708)
Commodity class 85	139.8* (25.55)	166.6* (19.83)	160.7* (20.43)	205.9* (19.57)
Commodity class 100	225.7* (41.27)	259.8* (30.92)	254.3* (32.34)	327.4* (31.12)
Carrier 1	-146.1* (-29.86)	-226.2* (-29.87)	-230.9* (-30.15)	
Carrier 2	-148.1* (-24.25)	-165.3* (-24.15)	-158.7* (-22.78)	-9.056 (-1.616)
Carrier 3				
Carrier 4	-266.5* (-44.31)	-269.8* (-37.51)	-267.0* (-38.81)	-84.34* (-14.11)
Carrier 5	-236.6* (-39.34)	-254.2* (-37.69)	-253.6* (-36.87)	40.40* (6.461)
Carrier 6	-236.1* (-36.91)	-189.5* (-25.36)		-70.00* (-6.235)
Carrier 7				
Carrier 8	-46.87* (-9.578)			

Continued

Table 1A. Route-by-Route Freight Rate Estimation - Arizona. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis) Route 1	Route 2	Route 3	Route 4
Carrier 9	-242.6* (-35.43)	-196.2* (-25.07)		
Carrier 10			-117.2* (-21.08)	
Carrier 11	-66.07* (-9.342)	-23.34* (-2.932)	-80.47* (-9.835)	
Carrier 13	-168.9* (-18.03)	-122.1* (-10.84)	-146.1* (-16.63)	
Carrier 14				
Carrier 15	-221.1* (-33.72)	-241.8 (-32.78)		-82.19* (-13.56)
Carrier 16	21.63* (3.501)	24.59* (3.545)	25.33* (3.577)	
Carrier 17	-245.4* (-40.80)	-263.9* (-39.12)		
Carrier 18				
Year 1980	-55.73* (-5.305)	-179.1* (-10.43)	-89.00* (-5.947)	-92.99* (-4.646)
Year 1981	42.88* (4.229)	-31.12 (-2.072)	-11.01 (-.7470)	-22.90 (-1.162)
Year 1983	4.442 (.8550)	7.301 (1.165)	7.709 (1.066)	-20.71 (-2.129)
Year 1984	-1.506 (-.1520)	.7414 (.06400)	1.519 (.1110)	-1.513 (-.08900)
Deregulated (DEREG)	400.1* (5.151)	495.9* (3.955)	392.8* (3.615)	1330.* (9.350)
I-Shipment weight	.002279* (9.205)	.002929* (8.150)	.001633* (4.643)	.003162* (6.865)
I-Fuel cost	-2.467* (-4.544)	-3.933* (-4.570)	-2.418* (-3.196)	11.96* (12.16)

Continued

Table 1A. Route-by-Route Freight Rate Estimation - Arizona. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis)			
	Route 1	Route 2	Route 3	Route 4
I-Unemployment rate	-2.209 (-.5690)	-2.250 (-.403)	-6.479 (-1.147)	-6.093 (-.8280)
I-Commodity class 70	-.4346 (-.06900)	.6386 (.07000)	2.756 (.3070)	-18.25 (-1.551)
I-Commodity class 85	-1.576 (-.2490)	-2.123 (-.2310)	2.294 (.2550)	-47.47* (-4.034)
I-Commodity class 100	-2.429 (-.3840)	-.4979 (-.05400)	4.609 (.5130)	-75.32* (-6.401)
I-Carrier 1	-83.07* (10.71)	17.42* (17.01)		
I-Carrier 3				
I-Carrier 6				
I-Carrier 8	-186.3* (-18.60)		-78.43* (-8.867)	
I-Carrier 10				
I-Carrier 13	-92.68* (-8.324)	-13.70 (-1.043)		
F	1119*	1003*	856.7*	637.0*
R^2	.82	.83	.81	.83
Number of observations	7,643	6,323	5,123	2,983

Note: "I-" denotes an interaction term between the variable following and DEREG.

Table 1A. Route-by-Route Freight Rate Estimation - Arizona. Continued.

Independent	Parameter Estimate (t statistics are in parenthesis)			
Variable	Route 5	Route 6	Route 7	Route 8
Intercept	374.7* (4.491)	1.362 (.01700)	42.33 (.5220)	261.7 (2.243)
Shipment weight	-.01366* (-51.18)	-.01596* (-63.81)	-.01617* (-62.13)	-.01354* (-36.15)
Fuel cost	.1557 (.2860)	3.878* (7.613)	3.846* (7.255)	.4612 (.6050)
Unemployment rate	9.206 (2.175)	9.787* (2.468)	8.416 (2.039)	18.66* (3.142)
Commodity class 70	54.97* (8.068)	50.60* (7.925)	47.47* (7.145)	62.36* (6.523)
Commodity class 85	135.1* (19.82)	133.7* (20.94)	136.6* (20.55)	155.08* (16.22)
Commodity class 100	218.1* (32.01)	213.7* (33.48)	220.7* (33.21)	244.5* (25.57)
Carrier 1	-36.72* (6.052)	-182.6* (-28.73)	-197.6 (-29.44)	-46.87* (-8.242)
Carrier 2	2.653 (.4270)	23.55 (2.274)	-15.70 (-1.455)	51.14* (10.04)
Carrier 3				
Carrier 4	-48.07* (-6.930)	-196.7* (-27.84)	-220.8* (-30.01)	-89.10* (-14.11)
Carrier 5	-59.00* (-9.724)	-189.8* (-29.44)	-210.9* (-31.42)	18.70* (3.443)
Carrier 6	-41.62* (-5.417)	-127.1* (-28.16)	-109.8* (-22.74)	
Carrier 7	-27.65* (-4.557)			
Carrier 8	-10.33 (-1.333)			

Continued

Table 1A. Route-by-Route Freight Rate Estimation - Arizona. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis) Route 5	Route 6	Route 7	Route 8
Carrier 9	-24.20* (-3.528)			
Carrier 10				
Carrier 11				
Carrier 13				
Carrier 14				
Carrier 15				
Carrier 16	252.2* (40.99)			
Carrier 17	-89.15* (-14.69)	-205.2* (-36.24)	-222.0* (-37.67)	
Carrier 18				
Year 1980	-29.30 (-2.260)	-61.51* (-5.063)	-86.65* (-6.853)	23.47 (1.290)
Year 1981	15.70 (1.229)	1.374 (.1150)	-25.06 (-2.012)	48.21* (2.690)
Year 1983	3.557 (.6160)	-4.169 (-.5310)	-2.764 (-.3370)	-25.60* (-2.803)
Year 1984	1.203 (.1100)	-1.614 (-.1110)	-1.004 (-.06600)	-35.42 (-2.189)
Deregulated (DEREG)	117.7 (1.271)	605.2* (6.435)	589.0* (6.016)	451.4* (3.464)
I-Shipment weight	-.0009814* (-3.277)	.001438* (4.753)	.001344* (4.263)	-.002560* (-6.055)
I-Fuel cost	-.2635 (-.4100)	-4.093* (-6.186)	-3.969* (-5.750)	-1.003 (-1.106)

Continued

Table 1A. Route-by-Route Freight Rate Estimation - Arizona. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis)			
	Route 5	Route 6	Route 7	Route 8
I-Unemployment rate	-8.054 (-1.679)	-10.59 (-2.136)	-8.973 (-1.734)	-30.12* (-4.446)
I-Commodity class 70	-.2138 (-.02800)	-1.214 (-.1570)	3.963 (.4920)	2.551 (.2360)
I-Commodity class 85	3.889 (.5080)	-6.506 (-.8420)	-3.201* (-3.3980)	13.63 (1.262)
I-Commodity class 100	6.649 (.8690)	-12.23 (-1.584)	-6.735 (-.8370)	22.16 (2.051)
I-Carrier 1				
I-Carrier 3				
I-Carrier 6		-20.55* -2.838	-53.81* (-7.142)	
I-Carrier 8	-31.30* (-3.993)			
I-Carrier 10				
I-Carrier 13				
F	949.3*	768.3*	742.5*	603.9*
R^2	.82	.83	.83	.82
Number of observations	5,807	3,783	3,763	2,763

Note: "I-" denotes an interaction term between the variable following and DEREG.

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Table 1A. Route-by-Route Freight Rate Estimation - Arizona. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis) Route 9	Route 10	Route 11	Route 12
Intercept	341.1* (2.573)	143.3 (.7310)	375.6* (4.178)	404.7* (4.538)
Shipment weight	-.01532* (-36.01)	-.02821* (-50.00)		-.01282* (-44.81)
Fuel cost	-.001088 (-.001000)	.2691 (.2100)	.1799 (.3050)	.0000 (.0000)
Unemployment rate	20.38* (3.021)	25.33* (2.792)	10.17* (2.449)	.0000 (.0000)
Commodity class 70	62.48* (5.753)	118.2* (8.206)	45.95* (6.733)*	58.40* (7.996)
Commodity class 85	163.0* (15.01)	296.9* (20.62)	116.7* (17.10)	145.4* (19.91)
Commodity class 100	259.3* (23.87)	469.4* (32.59)	183.5* (26.89)	231.9* (31.75)
Carrier 1	.9860 (.1300)	525.4* (45.34)		
Carrier 2			-34.63* (-4.181)	58.59* (5.953)
Carrier 3			-105.1* (-10.94)	78.45* (15.19)
Carrier 4				
Carrier 5	84.11* (9.998)	282.6* (23.80)	-115.8* (-17.89)	-126.2* (-16.52)
Carrier 6		239.7* (14.27)	-104.1* (-24.52)	-72.19* (-6.727)
Carrier 7			-103.9* (-23.30)	-88.05* (-13.00)
Carrier 8		549.4* (32.64)	-109.3* (-15.26)	

Continued

Table 1A. Route-by-Route Freight Rate Estimation - Arizona. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis) Route 9	Route 10	Route 11	Route 12
Carrier 9				
Carrier 10				
Carrier 11				
Carrier 13				
Carrier 14				
Carrier 15				
Carrier 16				146.2* (20.85)
Carrier 17				
Carrier 18	232.1* (31.21)	719.5* (49.72)		
Year 1980	7.214 (.3480)	-4.378 (-.1520)	-.7309 (-.05600)	.0000 (.0000)
Year 1981	42.43 (2.084)	54.55 (2.064)	20.60 (1.712)	.0000 (.0000)
Year 1983	-15.45 (-1.404)	-44.16 (-2.160)	-7.250 (-1.114)	22.02* (2.587)
Year 1984	21.26 (.9650)	28.26 (-.7450)	-.6247 (-.05000)	-5.237 (-.3150)
Deregulated (DEREG)	257.8 (1.659)	581.6* (2.471)	162.9 (1.628)	93.15 (.8750)
I-Shipment weight	-.003376* (-6.707)	.002724* (3.934)	-.00010558 (-.3430)	-.001979* (-5.715)
I-Fuel cost	-.5087 (-.4660)	-.7609 (-.4690)	-.3272 (-.4670)	.6998 (.9330)

Continued

Table 1A. Route-by-Route Freight Rate Estimation - Arizona. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis)			
	Route 9	Route 10	Route 11	Route 12
I-Unemployment rate	-20.96* (-2.570)	-49.84* (-4.189)	-12.23* (-2.499)	-.3438 (-.06000)
I-Commodity class 70	12.80 (.9960)	-8.980 (-.5080)	-7.206 (-.9160)	2.714 (.3070)
I-Commodity class 85	30.69* (2.388)	-22.38 (-1.266)	-12.11 (-1.538)	-7.783 (.8800)
I-Commodity class 100	49.18* (3.827)	-33.06 (-1.871)	-11.48 (-1.459)	15.70 (1.775)
I-Carrier 1				
I-Carrier 3			-4.299 (-.4500)	-172.8* (-20.29)
I-Carrier 6				
I-Carrier 8		.1433 (.007000)		
I-Carrier 10				
I-Carrier 13				
F	548.0*	588.4*	564.9*	668.1*
R^2	.84	.84	.81	.81
Number of observations	2,099	2,679	3,223	3,767

Note: "I-" denotes an interaction term between the variable following and DEREG.

* denotes significantly different from zero at the .01 level.

.0000 denotes less than .00005.

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Table 1B. Route-by-Route Freight Rate Estimation - Florida.

Independent Variable	Parameter Estimate (t statistics are in parenthesis)			
	Route 1	Route 2	Route 3	Route 4
Intercept	219.4*	238.3*	261.2*	281.9*
	(11.00)	(11.29)	(11.72)	(12.03)
Shipment weight	-.007541*	-.008245*	-.008778*	-.009502*
	(-61.55)	(-63.55)	(-64.08)	(-66.00)
Fuel cost	-.01918	-.0109	-.01260	-.01326
	(-.1360)	(-.0730)	(-.08000)	(-.08000)
Unemployment rate	-.3363	-.4321	-.4996	-.5660
	(-.2890)	(-.3510)	(-.3840)	(-.4140)
Commodity class 70	15.18*	15.25*	15.60*	17.58*
	(4.624)	(4.387)	(4.250)	(4.558)
Commodity class 77	34.96*	38.85*	38.39*	44.02*
	(10.65)	(11.18)	(10.46)	(11.41)
Commodity class 100	96.94*	109.8*	119.0*	132.8*
	(29.53)	(31.59)	(32.43)	(34.44)
Commodity class 125	171.80*	186.4*	198.3*	215.0*
	(52.33)	(53.63)	(54.03)	(55.75)
Carrier 2	-9.706*	-9.232*	-9.512*	-9.892*
	(-3.093)	(-2.778)	(-2.711)	(-2.683)
Carrier 3	-2.991	-2.727	-2.375	-2.132
	(-.9530)	(-.8210)	(-.6770)	(-.5780)
Carrier 4	15.74*	17.58*	19.80*	21.90*
	(5.015)	(5.290)	(5.643)	(5.938)
Year 1979	-12.79	-13.80	-14.88	-16.07
	(-1.974)	(-2.010)	(-2.053)	(-2.109)
Year 1981	8.213	-8.899	9.453	10.03
	(1.857)	(1.900)	(1.911)	(1.930)
Year 1982	15.24*	16.27*	17.45*	18.68*
	(3.590)	(3.619)	(3.677)	(3.746)
Year 1983	26.72*	28.79*	31.13*	33.57*
	(6.007)	(6.114)	(6.259)	(6.424)
Year 1984	74.70*	80.30*	86.32*	92.69*
	(17.12)	(17.38)	(17.70)	(18.08)

Continued

Table 1B. Route-by-Route Freight Rate Estimation - Florida. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis) Route 1	Route 2	Route 3	Route 4
Deregulated (DEREG)	-6.228 (-.1720)	-4.882 (-.1280)	-6.534 (-.162)	-7.949 (-.1870)
I-Shipment weight	.0003814 (2.111)	.0004137 (2.162)	.0004575 (2.264)	.0004945* (2.329)
I-Fuel cost	.07804 (.3050)	.07291 (.2690)	.08480 (.2960)	.0004945* (2.329)
I-Unemployment rate	-1.224 (-.7970)	-1.377 (-.8470)	-1.406 (-.8190)	-1.449 (-.8030)
I-Commodity class 70	-.06967 (-.0140)	-.1069 (-.0210)	-.1052 (-.01900)	-.08380 (-.01500)
I-Commodity class 77	-.2156 (-.04500)	-.2268 (-.0440)	-.2973 (-.05500)	-.3103 (-.05500)
I-Commodity class 100	-.6413 (-.1320)	-.7123 (.1390)	-.8662 (-.1600)	-.8754 (-.1540)
I-Commodity class 125	-1.417 (-.2930)	-1.536 (-.3000)	-1.575 (-.2910)	-1.760 (-.3090)
I-Carrier 2	18.12* (4.029)	19.4* (4.082)	20.77* (4.130)	22.19* (4.199)
I-Carrier 3	13.98* (3.151)	15.00* (3.193)	15.97* (3.221)	17.02* (3.265)
I-Carrier 4	12.19* (2.747)	13.04* (2.776)	13.78* (2.779)	14.60* (2.802)
F	561.1*	598.0*	613.3*	652.3*
R^2	.74	.75	.75	.76

Continued

Table 1B. Route-by-Route Freight Rate Estimation - Florida. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis) Route 5	Route 6	Route 7	Route 8
Intercept	283.4* (11.99)	298.2* (12.15)	312.8 (12.53)	335.3* (12.81)
Shipment weight	-.009519* (-65.56)	-.01005* (-66.64)	-.01033* (-67.34)	-.01097* (-68.23)
Fuel cost	-.01492 (-.08900)	-.0002183 (-.001000)	-.01554 (-.08800)	-.01702 (-.09200)
Unemployment rate	-.5856 (-.4250)	-.4184 (-.2920)	-.6710 (-.4610)	-.7311 (-.4790)
Commodity class 70	17.89* (4.598)	20.97* (5.190)	21.58* (5.254)	24.36* (5.654)
Commodity class 77	47.59* (12.23)	52.98* (13.11)	50.96* (12.41)	62.05* (14.40)
Commodity class 100	135.8* (34.91)	142.6* (35.31)	145.3* (35.37)	151.4* (35.14)
Commodity class 125	219.3* (56.38)	233.5* (57.79)	237.5* (57.81)	253.2* (58.78)
Carrier 2	-9.729* (-2.616)	-10.09* (-2.614)	-10.06* (-2.563)	-10.02* (-2.433)
Carrier 3	-1.948 (-.5240)	-4.397 (-1.139)	-1.478 (-.3760)	-.8365 (-.2030)
Carrier 4	22.48* (6.045)	24.08* (6.235)	25.22* (6.422)	27.85* (6.763)
Year 1979	-16.24 (-2.113)	-17.06 (-2.138)	-17.62 (-2.172)	-18.93 (-2.226)
Year 1981	10.07 (1.921)	10.69 (1.964)	10.79 (1.949)	11.43 (1.970)
Year 1982	18.83* (3.745)	19.88* (3.805)	20.41* (3.842)	21.77* (3.909)
Year 1983	33.89* (6.429)	35.82* (6.543)	36.99* (6.647)	39.65* (6.793)
Year 1984	93.35* (18.06)	96.26* (17.93)	101.6* (18.61)	108.5* (18.96)

Continued

Table 1B. Route-by-Route Freight Rate Estimation - Florida. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis)			
	Route 5	Route 6	Route 7	Route 8
Deregulated (DEREG)	-8.868 (-.2070)	-5.0855 (-.1140)	-10.84 (-.2400)	-12.22 (-.2580)
I-Shipment weight	.0004983* (2.327)	.0005021 (2.258)	.0005447* (2.409)	.0005917* (2.495)
I-Fuel cost	.1014 (.3340)	.07743 (.2460)	.1159 (.3620)	.1269 (.3770)
I-Unemployment rate	-1.415 (-.7780)	-1.621 (-.8580)	-1.470 (-.7650)	-1.527 (-.7570)
I-Commodity class 70	-.1558 (-.0270)	-.07151 (-.01200)	-.1268 (-.0210)	-.2201 (-.03500)
I-Commodity class 77	-.3627 (-.0630)	-.03431 (-.006000)	-.2775 (-.04600)	-.5051 (-.07900)
I-Commodity class 100	-.9321 (-.1620)	-1.503 (-.2520)	-.8119 (-.1340)	-.8059 (-.1270)
I-Commodity class 125	-1.737 (-.3030)	-2.319 (-.3890)	-1.797 (-.2970)	-1.998 (-.3140)
I-Carrier 2	22.28* (4.180)	23.56* (4.258)	24.12* (4.287)	25.70* (4.355)
I-Carrier 3	17.02* (3.238)	19.97* (3.658)	18.32* (3.301)	19.52* (3.354)
I-Carrier 4	14.57* (2.772)	15.36* (2.814)	15.65* (2.820)	16.60* (2.851)
F	654.0*	673.7*	685.8*	697.9*
R^2	.76	.77	.77	.78

Continued

Table 1B. Route-by-Route Freight Rate Estimation - Florida. Continued.

Independent	Parameter Estimate (t statistics are in parenthesis)			
Variable	Route 9	Route 10	Route 11	Route 12
Intercept	397.2* (13.71)	402.4* (13.49)	407.0* (13.70)	420.7* (14.16)
Shipment weight	-.01274* (-71.60)	-.01276* (-69.58)	-.01288* (-70.56)	-.01312* (-71.89)
Fuel cost	-.02437 (-.1190)	-.04967 (-.2350)	-.02510 (-.1190)	-.02521 (-.1200)
Unemployment rate	-.9007 (-.5330)	-.4447 (-.2560)	-.9153 (-.5280)	-.9636 (-.5560)
Commodity class 70	26.42* (59.27)	26.28* (5.350)	27.30* (5.581)	23.10* (4.725)
Commodity class 77	62.36* (34.99)	62.51* (12.72)	65.07* (13.30)	61.29* (12.54)
Commodity class 100	166.8* (13.08)	172.1* (33.05)	177.2* (36.21)	176.0* (35.98)
Commodity class 125	282.6* (5.541)	295.1* (60.08)	300.8* (61.49)	305.1* (62.40)
Carrier 2	-11.19* (-2.455)	-8.240 (-1.755)	-11.35* (-2.428)	-11.20* (-2.397)
Carrier 3	-.2213 (-.0490)	-.1699 (-.03600)	.1574 (.03400)	.1231 (.0260)
Carrier 4	32.84* (7.206)	33.59* (7.154)	34.42* (7.361)	35.10* (7.509)
Year 1979	-22.08* (-2.345)	-22.96* (-2.367)	-22.75* (-2.355)	-23.21* (-2.404)
Year 1981	12.91 (2.009)	13.19 (1.993)	13.19 (2.001)	13.41 (2.035)
Year 1982	24.89* (4.038)	29.91* (4.080)	25.55* (40.40)	26.11* (4.129)
Year 1983	45.68* (7.071)	45.37* (6.817)	46.96* (7.86)	48.21* (7.277)
Year 1984	124.4* (19.63)	125.9* (19.28)	127.7* (19.64)	130.8* (20.13)

Continued

Table 1B. Route-by-Route Freight Rate Estimation - Florida. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis) Route 9	Route 10	Route 11	Route 12
Deregulated (DEREG)	-16.43 (-.3130)	-20.24 (-.3740)	-17.41 (-.3240)	-18.11 (-.3370)
I-Shipment weight	.0006785* (2.585)	.0006825* (2.524)	.0007172* (2.663)	.0007247* (2.692)
I-Fuel cost	.1582 (.4250)	.1898 (.4950)	.1652 (.4330)	.1698 (.4450)
I-Unemployment rate	-1.610 (-.7220)	-1.697 (-.7390)	-1.635 (-.7150)	-1.636 (-.7150)
I-Commodity class 70	-.1778 (-.02500)	-.1319 (-.01800)	-.1801 (-.02500)	-.2272 (-.03200)
I-Commodity class 77	-.3933 (-.0560)	-.3816 (-.05300)	-.4089 (-.05700)	-.4326 (-.06000)
I-Commodity class 100	-.9323 (-.1330)	-1.037 (-.1430)	-1.102 (-.1530)	-1.092 (-.1510)
I-Commodity class 125	-2.225 (-.3160)	-1.195 (-.1650)	-2.203 (-.3050)	-2.214 (-.3070)
I-Carrier 2	29.19* (4.469)	30.28* (4.500)	29.97* (4.473)	30.63* (4.573)
I-Carrier 3	21.94* (3.405)	22.27* (3.356)	22.49* (3.403)	23.06* (3.490)
I-Carrier 4	18.63* (2.892)	18.87* (2.844)	18.97* (2.870)	19.45* (2.944)
F	742.8*	732.8*	759.7	791.2*
R^2	.78	.78	.79	.80

Continued

Table 1B. Route-by-Route Freight Rate Estimation - Florida. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis) Route 13	Route 14	Route 15	Route 16
Intercept	427.3* (14.20)	430.2* (14.21)	454.2* (14.53)	510.8* (14.90)
Shipment weight	-.01330* (-71.94)	-.01337* (-71.88)	-.01404* (-73.071)	-.01542* (-73.20)
Fuel cost	-.03682 (-.1730)	-.02529 (-.1180)	-.03597 (-.1620)	-.02847 (-.1170)
Unemployment rate	-.9187 (-.5240)	-1.009 (-.5720)	-.9977 (-.5470)	-1.196 (-.5980)
Commodity class 70	25.32* (5.109)	28.73* (5.764)	26.32* (5.115)	32.07* (5.681)
Commodity class 77	62.56* (12.63)	67.13* (13.47)	68.17* (13.25)	80.16* (14.20)
Commodity class 100	179.1* (36.15)	184.9* (37.09)	194.4* (37.77)	226.6* (40.15)
Commodity class 125	310.3* (62.62)	317.0* (63.60)	336.0* (65.30)	390.2* (69.13)
Carrier 2	-12.29* (-2.595)	-11.57* (-2.429)	-12.68* (-2.578)	-13.36* (-2.477)
Carrier 3	.07159 (.0150)	.08651 (.01800)	.2361 (.04800)	.8103 (.1500)
Carrier 4	35.66* (7.530)	36.47* (7.655)	38.20* (7.766)	43.85* (8.127)
Year 1979	-23.79* (-2.432)	-23.90* (-2.428)	-25.32* (-2.492	-28.66* (-2.571)
Year 1981	13.50 (2.023)	13.79 (2.053)	14.35 (2.069)	16.23 (2.134)
Year 1982	26.69* (4.166)	26.87* (4.169)	28.37* (4.264)	31.90* (4.371)
Year 1983	49.11* (7.316)	49.65* (7.353)	52.34* (7.507)	59.24* (7.746)
Year 1984	133.2* (20.23)	134.5* (20.30)	141.8* (20.74)	160.3* (21.37)

Continued

Table 1B. Route-by-Route Freight Rate Estimation - Florida. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis) Route 13	Route 14	Route 15	Route 16
Deregulated (DEREG)	-21.09 (-.3870)	-19.21 (-.3500)	-22.23 (-.3930)	-22.91 (-.3690)
I-Shipment weight	.0007381* (2.706)	.0007440* (2.712)	.0007846* (2.770)	.0008940* (2.877)
I-Fuel cost	.1880 (.4860)	.1783 (.4590)	.1981 (.4930)	.2105 (.4780)
I-Unemployment rate	-1.556 (-.6710)	-1.651 (-.7080)	-1.659 (-.6890)	-1.945 (-.7360)
I-Commodity class 70	-.2292 (-.03100)	-.1708 (-.02300)	-.1084 (-.01400)	-.2316 (-.02800)
I-Commodity class 77	-.3200 (-.04400)	-.5858 (-.08000)	-.3331 (-.04400)	-.4456 (-.05400)
I-Commodity class 100	-1.048 (-.1430)	-1.182 (.1610)	-1.034 (-.1360)	-1.292 (-.1550)
I-Commodity class 125	-2.292 (-.3140)	-2.374 (-.3230)	-2.349 (-.3090)	-2.815 (-.3380)
I-Carrier 2	31.15* (4.589)	31.43* (4.603)	33.14* (4.701)	37.43* (4.841)
I-Carrier 3	23.41* (3.497)	23.61* (3.506)	24.92* (3.583)	28.17* (3.694)
I-Carrier 4	19.72* (2.945)	19.82* (2.943)	20.96* (3.015)	23.63* (3.099)
F	792.9*	801.4*	841.8*	895.5*
R^2	.80	.80	.81	.82

Continued

Table 1B. Route-by-Route Freight Rate Estimation - Florida. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis)			
	Route 17	Route 18	Route 19	Route 20
Intercept	312.8* (12.53)	397.2* (13.71)	407.0* (13.70)	430.2* (14.21)
Shipment weight	-.01035* (-67.34)	-.01274* (-71.60)	-.01288* (-70.56)	-.01337* (-71.88)
Fuel cost	-.01554 (-.08800)	-.02437 (-.1190)	-.02510 (-.1190)	-.02529 (-.1180)
Unemployment rate	-.6710 (-.4610)	-.9007 (-.5330)	-.9153 (-.5280)	-1.009 (-.5720)
Commodity class 70	21.58* (5.254)	26.42* (5.541)	27.30* (5.581)	28.73* (5.764)
Commodity class 77	50.96* (12.41)	62.36* (13.08)	65.07* (13.30)	67.13* (13.47)
Commodity class 100	145.3* (35.37)	166.8* (34.99)	177.2* (36.21)	184.9* (37.09)
Commodity class 125	237.5* (57.81)	282.6* (59.27)	300.8* (61.49)	317.0* (63.60)
Carrier 2	-10.06* (-2.563)	-11.19* (-2.455)	-11.35* (-2.428)	-11.57* (-2.429)
Carrier 3	-1.478 (-.3760)	-.2213 (-.04900)	.1574 (.03400)	.08651 (.01800)
Carrier 4	25.22* (6.422)	32.84* (7.206)	34.42* (7.361)	36.47* (7.655)
Year 1979	-17.62 (-2.172)	-22.08* (-2.345)	-22.75* (-2.355)	-23.90* (-2.428)
Year 1981	10.79 (1.949)	12.91 (2.009)	13.19 (2.001)	13.79 (2.053)
Year 1982	20.41* (3.842)	24.89* (4.038)	25.55* (4.040)	26.67* (4.169)
Year 1983	36.99* (6.647)	45.68* (7.071)	46.96* (7.086)	49.65* (7.353)
Year 1984	101.6* (18.61)	124.4* (19.63)	127.7* (19.64)	134.5* (20.30)

Continued

Table 1B. Route-by-Route Freight Rate Estimation - Florida. Continued.

Independent Variable	Parameter Estimate (t statistics are in parenthesis)			
	Route 17	Route 18	Route 19	Route 20
Deregulated (DEREG)	-10.84 (-.2400)	-16.43 (-.3130)	-17.41 (-.3240)	-19.21 (-.3500)
I-Shipment weight	.0005447* (2.409)	.0006785* (2.585)	.0007172* (2.663)	.0007440* (2.712)
I-Fuel cost	.11592 (.3620)	.1582 (.4250)	.1652 (.4330)	.1783 (.4590)
I-Unemployment rate	-1.470 (-.7650)	-1.610 (-.7220)	-1.635 (-.7150)	-1.651 (-.7080)
I-Commodity class 70	-.1268 (-.02100)	-.1778 (-.02500)	-.1801 (-.02500)	-.1708 (-.02300)
I-Commodity class 77	-.2775 (-.04600)	-.3933 (-.0560)	-.4089 (-.05700)	-.5858 (-.0800)
I-Commodity class 100	-.8119 (-.1340)	-.9323 (.1330)	-1.102 (-.1503)	-1.182 (-.1610)
I-Commodity class 125	-1.797 (-.2970)	-2.225 (-.3160)	-2.203 (-.3050)	-2.374 (-.3230)
I-Carrier 2	24.12* (4.287)	29.19* (4.469)	29.97* (4.472)	31.43* (4.603)
I-Carrier 3	18.32* (3.301)	21.94* (3.405)	22.49* (3.403)	23.61* (3.506)
I-Carrier 4	15.65* (2.820)	18.63* (2.892)	18.97* (2.870)	19.82* (2.943)
F	685.8*	742.8*	759.7*	801.4*
R^2	.77	.79	.79*	.80

Note: t ratios in parenthesis.

* significantly different from zero at the .01 level.

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